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ABSTRACT

The document is comprised of four newsletters which present a collection of essays, practical teaching methods, and learning activities introducing future studies into the classroom. Aimed at primary and secondary teachers, subject areas include forecasting methods, curriculum implementation and evaluation, innovative teaching materials and strategies, computer-based instruction, energy usage and conservation, planning, technological literacy, and alternative education. The December 1977 issue discusses energy and the necessity for energy education, covering nuclear energy, teaching guidelines and ecological concepts, lesson plans developing creative capacities, a unit interrelating air pollution and math concepts, solar energy, a communication game, and bibliographies. The April 1978 issue chooses the best fourteen articles from past issues, including the definition and educational roles of a futurist, student attitudes toward future studies, the relevance of future studies, several games and other teaching methods. The Fall 1978 issue offers eight articles, discussing topics such as educational objectives and learning activities for energy conservation curriculum, a futures approach to teaching history, group grading, and the need for alternative decisional and problem solving approaches in future studies curriculum. The Spring 1979 issue presents essays exploring the future of education, Buckminster Fuller's synergetic approach, the role of science and technology in our society, and some pitfalls of educational futurism. It includes two futures learning activities and two examples of research in educational futurism. (CK)

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MAY 19 1978

Future Studies Program
School of Education
University of Massachusetts at Amherst

Fall 1977

Futures Information Interchange

U.S. DEPARTMENT OF HEALTH, EDUCATION & WELFARE
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Energizing
Future Studies
Al Peakes

INTRODUCTION

ENERGY FOR A STRONGER HUMAN COMMUNITY

We have attempted something new in this edition of the Futures Information Interchange. We have focused the issue on a single topic: energy. This does not represent a new style or policy for the FII. This time, though, we felt that special attention needs to be given to the one current issue which involves all of us probably more than any other. No matter how one feels about the energy issue it can be agreed that there is a great necessity to bring energy education into the classroom.

In keeping with the overall theme of the FII and the Program, the article by Al Peakes and Mark Cherniak explains how energy may provide the best mechanism for introducing futures in the classroom. Becky Kent and James Masker offer some interesting classroom activities centered around the energy issue. Kathe Chatwood offers a different kind of energy idea--the use of creative energy. We also have in this issue a bibliography of worthwhile energy readings for teachers and an article donated by one of our readers -- Edward Rappe -- on the semantics of futures.

We open with an editorial by Peter Wagschal, Director of the UMass Future Studies Program, which calls for a commitment to the development of alternative energy sources. It is our hope that we can begin to teach about energy in such a way as to encourage safe, equal and efficient distribution of energy for everyone under the sun.

But there are other considerations. My preference is for smallness, local control, tools that I can control and that can't control me. Nuclear energy requires, thus, a degree of largeness, centralization, and self-serving technology that I find hard to tolerate.

And then there are the questions of how appropriate the energy source is to its end use, and of how much energy is wasted along the way. On both counts, nuclear energy comes up empty. The electricity generated by nuclear reactors will, for the most part, be used for purposes which are simply not appropriate to a form of energy which has some very specialized capabilities - e.g., for producing motion. And the amount of wasted energy - mostly in the form of unused heat - is staggering.

Of course, if nuclear energy were the only game in town, then even these problems might be surmountable. But there are, in fact, a lot of other possibilities - none of which possess the inherent dangers of nuclear energy and many of which fit more closely with my penchant for smallness, local control, controlability, appropriateness of source to end use and lack of waste.

This is not, perhaps, the place to elaborate on these alternatives. The reader should refer to our bibliography for more information. Suffice it is to say that I am more than convinced that the world's real energy needs can be met over the coming decades through solar, wind, geothermal, tidal, hydro, biomass, and ocean gradient, energies and through a reasonable program of avoiding waste and matching energy sources to their end uses.

But there is a final consideration - and perhaps the most important one, ultimately. At some time in its history, humanity has no choice but to stop relying on the Earth's capital storehouse of energy - including fissionable matter - and obtain what it needs from the Earth's daily income of energy. As Bucky Fuller is so fond of saying, you can't drive the car on the battery alone forever - eventually - before it runs out - you have to use it to start the car. Nuclear energy tempts us to believe that the car's battery can last forever, that we can consume energy at a high rate with no penalty, and that it doesn't really matter where the energy comes from, as long as we have it.

But it does matter. There is a qualitative difference between a world run on totally renewable energy sources and a world teetering on the brink of nuclear catastrophe's, blackmails, and sabotages. For myself - and more importantly for my children - I want the renewable energy sources and see no benefit whatsoever in postponing the inevitable through playing deadly games with atoms.

The Futures Information Interchange Newsletter is a collection of practical teaching methods and learning activities for introducing future studies into the classroom. Although the newsletter is directed toward primary and secondary school teachers, it is intended to be of value to educators at the pre-school and university levels also.

Contributions to the Newsletter: The newsletter staff welcomes any specific materials related to your future-oriented work in the classroom that you would like to interchange.

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Consulting

The Future Studies Program has qualified graduate students who are available to schools, non-profit organizations and governments. They will bring educational strategies, audio-visual materials, and curricular materials upon request. Terms of employment are negotiable. For further information, contact Robert Kahn, Future Studies Program.

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Graduate Admissions

The Future Studies Program is searching for persons interested in enrolling in the program as graduate students for 1978 admission. Applicants should write the program for additional information. Affirmative Action applicants are especially encouraged to apply.

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FUTURES INFORMATION INTERCHANGE

Vol. V No. 1 December, 1977

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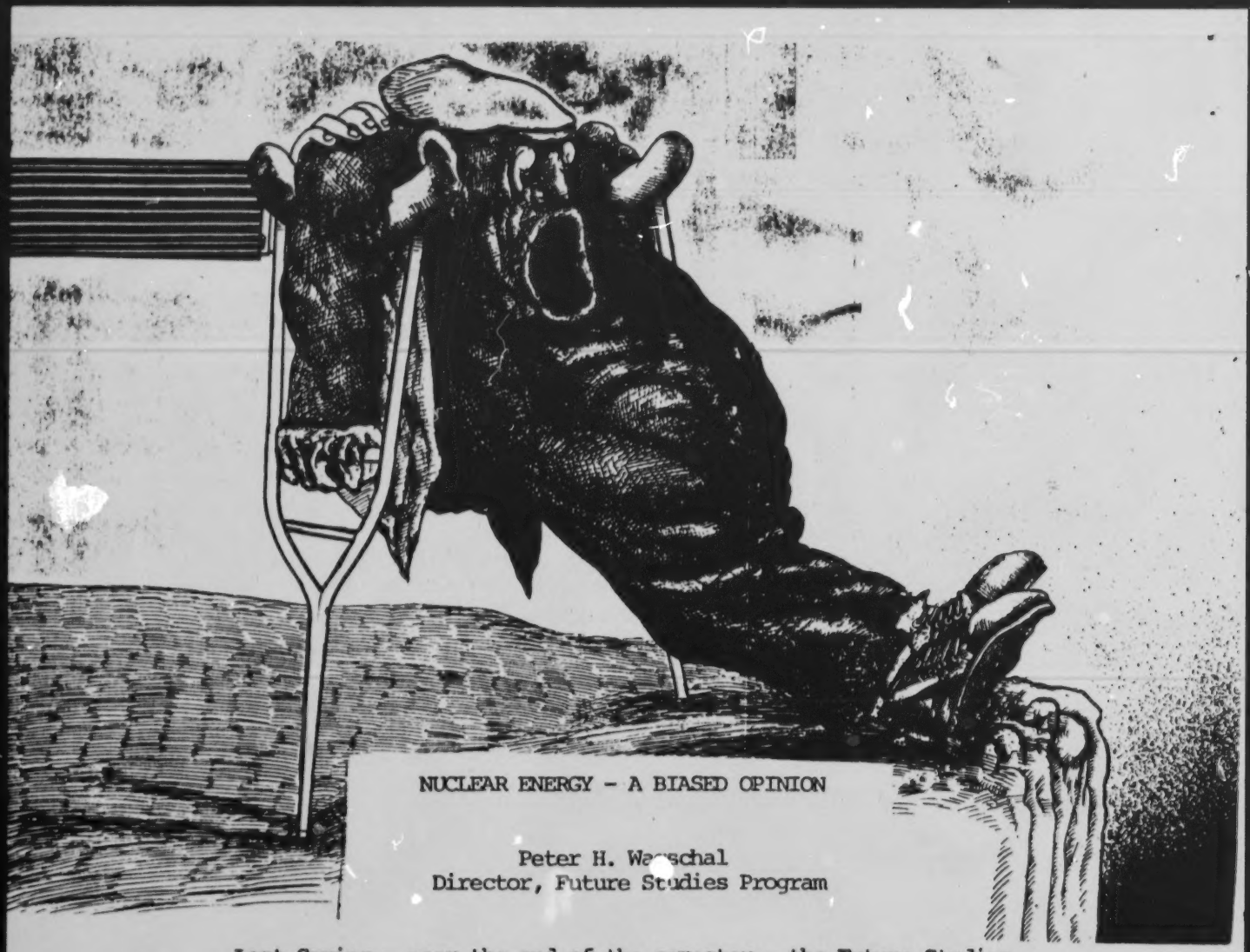


NUCLEAR ENERGY - A BIASED OPINION

Peter H. Wagschal
Director, Future Studies Program

Last Spring - near the end of the semester - the Future Studies Program decided to take a stand in favor of renewable energy sources and in opposition to nuclear energy. The thoughts and sentiments that follow are not, I am sure, shared by all members of the program, but they constitute the compelling reasons for my inclinations toward "alternative" energy and my displeasure with the pursuit of nuclear energy. The program welcomes, and will print, replies.

As is the case with most of the difficult decisions that face the globe these days, the decision regarding nuclear energy is not one which follows neatly from a clear set of data and a strict course of logic. The imponderables are too frequent, the data too sloppy, and the consequences too profound for anything but a self-consciously value-laden argument. What follows, then, is far from a logically coherent argument. Rather, it is a set of - for me - persuasive hunches that lead me to believe strongly in the value of promoting a variety of renewable energy sources and in the futility of pursuing nuclear energy.

First and foremost, of course, are the dangers. They range from human fallibility to the risks - however slight - of melt-downs, sabotage, leakage of radioactive wastes, etc. They include hazards to generations hundreds of years in the future and a potential proliferation of nuclear weaponry and fissionable material that will involve the entire globe. The dangers are so immense in their scope and duration as to be sufficient in themselves to avoid pursuing nuclear energy.

TEACHING AND LEARNING ABOUT ENERGY

Mark J. Cherniack and Allan L. Peakes

Conservation and socialization represent two of the most constructive ways that educational institutions can deal with energy. Historically, these represent roles that schools have allegedly fulfilled. Given our current realities, it is more urgent than ever that these roles become realized. All energy experts agree that the next twenty years will be a time of short energy supply and rising prices. Therefore, schools can impact both energy supply and the public's attitude toward its distribution.

Our message is twofold: first, to provide some constructive ideas for classroom teachers for the facilitation of teaching about energy and related matters; secondly, to provide a set of guidelines that are more appropriate than those presently in practice. We do not purport that these are broadly encompassing solutions, but rather that they represent what we feel are some positive steps that our teachers and teacher training institutions might take to more successfully cope with the world of tomorrow.

What follows is a series of activities, hows and whys explained at least in part. Obviously, these should be tailored to fit your own class, depending on size, structure, and age level. They have been gleaned from a variety of sources. Some have sprung full-blown out of our own creative process, others have come through review of the work of others, both literary and in practice.

We approach the energy issue from an environmental view, total concern with the total curriculum. A useful definition:

> An environment is anything which is influencing,
> or being influenced by, something else.

Everything works together. There is no such thing as the environment, there are many. Studying ecology helps us to understand some of our environments, but ultimately all subjects are environmentally relevant.

The concept of finitude, the limits of all things on the earth, is essential to energy. Here is an exercise that can help explore this area:

NOTE: Most of this article initially appeared in Croft's Educational Services, July, 1974.

Imagine that when you were born you were granted a bank account. Imagine further that this bank account contained all the money you would ever have. Once the money ran out, you would be absolutely unable to gain more from any other source. Imagine, finally, that the amount of money in your account was unknown. You would never know how much was left.

How would you spend your money? (Also look for connections between the nature of work and rewards.)

Then:

Imagine that when you were born, you were granted a life account. Imagine further that this life account contained all the days you would ever have. Once the days ran out, you would be absolutely unable to gain more from any other source. Imagine, finally, that the number of days in your account was unknown. You would always know how many days you had spent, but you would never know how many were left.

How would you spend your days?

And finally:

Imagine when you were born you were granted an environmental account. Imagine further that this environmental account contained all the resources you would ever have. Once the sources ran out, you would be absolutely unable to gain more from any other source. Imagine, finally, that the amount of resources in your account was not accurately known. You couldn't really even compute how many resources you had spent, let alone figure out how many were left.

How would you spend your environment?

We usually think of pollution as something that happens to us. A more useful view is that pollution happens because of us. Imagine yourself as your environment. Ask yourself how you get polluted and how you respond. (A food/nutrition study might be useful here.) Explore the relationship between pollution and your everyday activities.

Energy

The following concepts are keys to understanding and teaching about energy. We are greatly indebted to Howard T. Odum, who teaches ecology at the University of Florida in Gainesville.

1) Energy is measured by calories, BTU's, Kilowatt hours and other units, but energy has a scale of quality and usefulness that is not indicated by these measures.

2) The true value of energy to society is the net energy, which is what is left after the energy costs of getting and concentrating that energy are subtracted. Many calculations of energy reserves which are supposed to offer years of supply (coal) are listed as gross energy, rather than net energy and may last a shorter time than has been stated. Energy is consumed directly and indirectly by the people, machinery, and transportation systems to deliver energy. If it takes ten units of energy to bring ten units of energy to the point of use, then there is no net energy. Supposing that for every ten units of oil shale proposed as an energy source, nine units are required to mine, process, concentrate, transport and meet environmental standards. Such a source would yield one-tenth as much net energy and last one-tenth as long as was calculated. We should demand that estimates of energy reserves be figured in terms of net energy. The net reserves of fossil fuels are mainly unknown and surely must be much smaller than the gross reserves which have been the basis for present discussions and decisions. Such information is vital for the present and future direction of our economy.

3) Increasing energy efficiency or output with new technology is not an energy solution, since most technological innovations are subsidized by energy-expensive processes. We build better machines by putting more energy into the complex factories for manufacturing the equipment than may be returned when the new machines are operated. It will be changes in the patterns of human energy use that will increase energy efficiency. Schools are concerned with human energy. They can actively influence the change in energy values or they can merely react to the approaching limits.

4) Environmental technology which duplicates work available from the natural sector is an energy handicap. If human growth is so dense that environmental technology takes over the local ecosystem, it is too dense to be ecologically possible (for long) for a combined system of people and nature. Construction of industrial (energy-expensive) complexes to recycle the enormous waste of other such complexes is not an energy or waste solution. Development of anti-pollution industries does not address the fact of continued pollution-causing processes. It costs to produce waste. It costs to clean it up. We are paying twice with our disappearing resource account.

5) Nuclear energy is now subsidized with fossil fuels and barely yields net energy. For instance, in the most commonly used energy-producers, high costs of mining, processing fuels, building plants, storing wastes (for hundreds of years), operating complex safety sys-

tems and government agencies make present nuclear energy a marginal source. The high energy cost of nuclear construction is a factor in accelerating the depletion of fossil fuels. Present nuclear energy is using up the fuel necessary for the operation of the next generation power source, known as breeder reactors. (The essential process involves bombarding Uranium atoms with alpha particles to produce Plutonium). Along with the still theoretical fusion source, these reactors are uncertain in terms of their net energy yield and feasibility. In any case, it is becoming apparent that the environmental safety risks of present nuclear power are totally unacceptable.

6) Utilization of all energy sources—fossil fuel, hydro-electric, wind, tidal, solar, geothermal—and distribution of this energy toward needs assuring (not threatening) survival is our mandate for life. Nations already rich in energy are rushing to use the last of the oil reserves, assuring the growth of unstable world economic, political, and military conditions. World-wide inflation is being driven by the increasing amount of energy needed to obtain more energy. International political relationships are being reordered on the basis of energy interest. Military security is dependent upon substantial fossil fuel reserves which are, of course, rapidly disappearing.

7) The production of food must also have a net yield. We are spending approximately ten units of energy in growing, processing, transporting, wholesaling, retailing, and preparing food at home to obtain one unit of food energy. It takes seven to ten pounds of grain to produce a pound of beef. Our food growers are totally dependent on nitrogen fertilizers for huge crop yields. Nitrate fertilizer is produced by an energy-expensive process. It is, in short, supply and, if no alternatives are found, we can expect a large-scale famine. The U.S. cannot feed the world.

Have your students organize their everyday activities into those that require non-human energy and those that are accomplished only through human energy, or some combination of the two. What are alternatives to these activities that might replace them, or utilize different sources or amounts of energy to accomplish them? Are some activities more useful or wasteful? How do we decide? (Economic/social/environmental pressures). Which activities are related to survival (absolutely necessary), which to luxury or usefulness?

Have members of the class determine all of the different types of energy used in their homes and school. Then assign each student to a team. Have each team report on the length of time it took for the energy to become useable, and how long it took for us to use it. Then have them determine, to the best of their ability, how much of each form we have left and at what rates we are using each. Then ask

them what they expect to heat their homes with in twenty years. This will instruct participating students in the concepts of:

1. Physical change in nature
2. Consumption patterns
3. Limitations of supply
4. Diversity of supply
5. Types of resources
6. Amounts of energy; money and labor necessary to produce more energy
7. Futures planning
8. Developing alternate sources
9. Conservation of supply

Divide the class into three groups. Have one group describe in five hundred words or less the best possible world, in terms of energy supply and use, in the year 2000. Make sure they briefly describe how it came to be. Have another group write a brief descriptive account, of similar length, of the worst possible world, again in terms of energy use and supply, in the year 2000. Make sure this group includes a section on how they would, or could, inhabit such a place. Finally, have the last group write a brief essay describing what they feel will be the most probable world, with the emphasis being on our supply and consumption of energy in the year 2000. This group should include short sections on both the hows and the whys of some of the energy uses in our society.

An actual prolonged shortage of energy will, of course, necessitate design changes in school buildings, multiple use of the buildings for community functions year-round, a change in study/work schedules, linked with transportation availability and seasonal temperatures. If education is to play a more useful role in this society's future, there are other changes to be considered, as well.

CREATIVE ENERGIES

Kathleen Chatwood

Picasso's accurate assessment of the state of art in industrial societies "...the great majority in all places no longer have any sincere passion for art, which they consider at most as a diversion, a hobby, and a decoration..." is in a large part due to the educational experiences of recent generations. Twentieth Century educational curricula emphasize the sciences and rational, linear thinking over creative development in order to prepare people to live and work in an industrial society where the wealth ethos and concommitant class structures prevail. ("The wealthiest 1% of Americans holds about one-fifth of all wealth, and about one-half of all corporate stock. The remaining one-half of corporate stock is owned almost entirely by the wealthiest fifth of the population. The top fifth also accounts for nearly all personal savings in the economy, and hense, tends to maintain its position of wealth from generation to generation." Bowles and Gintes, Schooling in Capitalist America, Basic Books, Inc., Harper, N.Y., N.Y., 1976, p. 86.)

Present-day curricula may be rationalized in a society where obedience to the established hierarchy, efficiency of management and production, and accumulation of material goods are the majority's values and the basis of the society's structure. It may be offered for examination, however, that the extension of such values has led industrial societies down the road to their current serious post-industrial social and economic problems, i.e., alienation, unemployment, and deterioration of the environment, with its concommitant side-effects of pollution and decline of physical and mental health among the populace. Education, along with the family, is the basic socializing institution for the young. It affects the formation of personality and consciousness, rewarding the development of certain capacities and expression of certain needs, while penalizing and invalidating others. Creativity and independence are traits repressed by academic institutions, as recent studies on I.Q. and educator attitudes toward students reveal. (Richard C. Edwards, "Personality Traits and 'Success' in Schooling and Work," Educational and Psychological Measurements, in Press, 1976.)

It is ironic that the very traits needed to foster the leadership to solve the macro-problems of today and tomorrow are systematically de-emphasized in the classroom. An egalitarian curriculum devotes equal educational/acculturational experience to the development of the individual's creative as well as cognitive capacities by specifically integrating aesthetic, kinesthetic, and interpersonal learning

opportunities into the program of study. Curriculum change starts with individual teachers who innovate within their own schools. As members of curriculum committees, educators have the capacity to facilitate adoption of curricular programs which incorporate creative learnings into the school's offerings for their students.

The following curricular format plans are derived from activities conducted at Naropa Institute in Boulder, Colorado under the auspices of the Rockefeller Foundation's support of art education programs. "The Arts in Education" is a teacher retraining project in which some fifty-five educators from the United States and Canada participated in experiences encouraging the design and integration of the arts and the aesthetic perspective into a variety of subject areas. It is hoped that educators will be able to elaborate upon or scale down the following curricular formats so that they are usable in several subject area and classroom settings. Their intent is to present simple aesthetic content concepts to students through group participatory activities, in the belief that education's purpose is not merely preparing people for earning money, nor acquiring status. Education is, rather, an opportunity to explore and develop one's personal capabilities and relationships with others in the society, finally developing the ability to learn how to learn throughout one's life.

ACTIVITY # 1 -- Theatre Arts: (Special thanks to Lee Worley, Naropa Theatre & Arts Department)

GENERAL OBJECTIVES:

1. To develop self-assurance in students when speaking or performing before an audience.

2. To introduce improvisation and spontaneity into classroom skills.

3. To provide opportunity for emotional and movement expression.

4. To provide students with the opportunity to see and enact the interpretation and changes in communication caused by people's differing personalities and styles.

5. To provide practice in group cooperation, teaming, and communication.

SPECIFIC OBJECTIVES:

The students will be able...

1. To act briefly before an audience by imitating and creatively changing a given gesture/sound as evidenced by participating effectively in the classroom activity.

2. To create spontaneously in a brief time period by using movement and sound, as evidenced by effective participation in the classroom activity.

3. To communicate effectively with another by introducing gestures and sounds for them to initiate, interpret, and change, as evidenced by effective participation in the classroom activity.

4. To provide practice in interpreting and imitating personal expressions and body language, as evidenced by successfully participating in the classroom activity.

CONTENT CONCEPTS:

IMPROVISATION: is spontaneous creation of an emotion, action, or situation without much prior planning. It depends on using one's materials (e.g., music, movement, speech, visual art equipment) to express your feeling or intention. One needs to rely on one's intuition rather than on one's ability to figure out the situation logically in order to improvise well. Key phrase - just do it!

INHIBITION: is a self-consciousness that results from worrying about what other people think of you instead of doing what would feel natural for you to do if you were engaging in the artistic activity at home alone (e.g., dancing, painting, singing, etc.).

BODY LANGUAGE: is a combination of the various gestures, unconscious sounds and body positions one uses to silently communicate with other human beings, (i.e., sitting in a group facing away from someone shows something about one's attitude toward that person... indifference, anger, avoidance, etc.).

ACTIVITY:

Have students line up in two facing lines with five to seven people in each line. One student starts with a gesture and a noise/sound (no words please) and slowly carries that gesture/sound across to someone in the opposing line, repeating the gesture/sound several times on the way across. S/he stands in front of the selected person, repeating the gesture/sound until that person can imitate it adequately. Students should focus their eyes on their receiver across the way as soon as they start moving across the space between lines. Eye-contact signals the other person that they will have to copy and modify the gestures next.

The first person then assumes the other's place in line while the second person starts moving across the space between lines. S/he somehow slightly changes or modifies the gesture/sound before reaching the opposite line. The same process is repeated by random people selected in the line, with each having their chance to send, receive, and modify the gesture/sound. Encourage students not to be too mental and create a story line with their group's gestures. They might want to carry an emotion further along in intensity during their line's turn, however (i.e., mild annoyance—to—screaming rage, etc.).

The purpose is to have one gesture/sound follow from another. Free range of facial expression and diversity of movement (i.e., standing, crawling, jumping, squatting) and articulation is here encouraged in order to loosen up students to perform and express themselves before others, as well as providing an opportunity for laughter. As any creative artist knows, spontaneity is part of the artistic process. Practice in such kinds of activities as this has the tendency to peel back layers of cultural conditioning blocking creativity and natural spontaneity.

FOLLOW-UP DISCUSSION - EVALUATION:

Ask students how the activity made them feel when it was their turn to initiate and modify the gesture/shound. How did the students react to other people in the group? Were they conscious of the moment the other person in the facing line caught their glance? Was it easy/difficult to imitate another? What did the students feel was the most creative sequence performed by members of the class? Why? Discuss the meaning of the content concepts. Option: Follow-up this activity with the homework assignment of storytelling without words by each student before the other members of the class the next day.

ACTIVITY # 2 — Dance and Movement: (Special thanks to Arawana Hayashi, Naropa Dance Department)

GENERAL OBJECTIVES, SPECIFIC OBJECTIVES, CONTENT CONCEPTS, are the same as Activity # 1.)

ACTIVITY:

Prefacing a study of technology (or in a P.E., Shop, Literature, Science, or History class) have students create machines made of human student bodies. In groups of five to seven, have students one by one go to the front of the room and simulate a moving part of an imaginary machine. The point is to have each student follow the initiating student and connect in some way with the previous student's gesture/sound as a moveable part of a totally new imaginary machine.

FOLLOW-UP DISCUSSION - EVALUATION:

After students sit down, have the class discuss a possible purpose of the machine. (It need not have one by the way.) Where did two people seem to fit together in an especially nice pattern or working relationship? What made the movement pleasing to the eye? Did the students in the machine-team take cues from each other, or did they just do something unrelated to the whole? This is a great exercise to video-tape and play back for a humorous discussion on the varieties of movement and sound. It also helps people to start feeling less inhibited about the use of their bodies in creative movement while endorsing the practice of team cooperation. Have students discuss what types of movement display a machine-like attitude. Free associate with students on how machines make them feel. The answers after this exercise will be quite revealing and could provide an interesting preface to discussion and study of the changing nature of technological societies as influenced by the use of different types of advanced machines (i.e., the computer, x-ray machines, etc.).

ACTIVITY # 3 — Visual Arts: (Special thanks to Jack Lieland, Naropa Visual Arts Department)

GENERAL OBJECTIVES:

1. To provide students with practice in synthesizing a whole from related parts.

2. To provide students with practice in discerning shapes and form.

3. To provide students with practice in seeing a series of givens from various and differing perspectives.

4. To replicate forms and images from their personal experiences with the materials provided.

5. To review the basic geometrical shapes.

SPECIFIC OBJECTIVES:

Students will be able to:

1. Combine all the tangram pieces into recognizable patterns resembling known forms of reality, as evidenced by successful completion of # tangrams.

2. Duplicate another's tangrams by fitting together the basic seven parts from an outline made of the original, as evidenced by successful duplication of # of other people's tangrams.

3. To recall successfully the geometric manes of the tangram parts, as evidenced by the ability of each student to fold and label a tan model.

4. To be able to divide a given rectangle into tangram parts successfully in class.

CONTENT CONCEPTS:

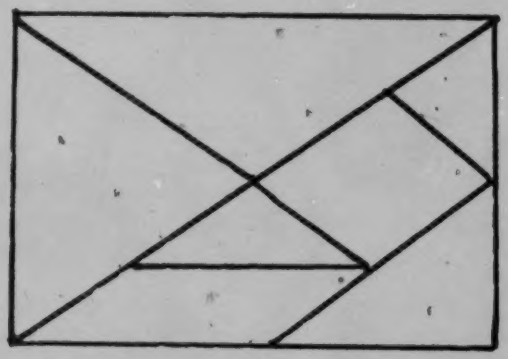
DIVERGENT THINKING: is generating many approaches and solutions for a given problem. Such thinking involves repeatedly putting together the parts of problems in several different and creative ways in order to derive many new solutions.

SYNTHESIS: is a high order mental activity which requires that the person be able to put together a new whole from several separate parts.

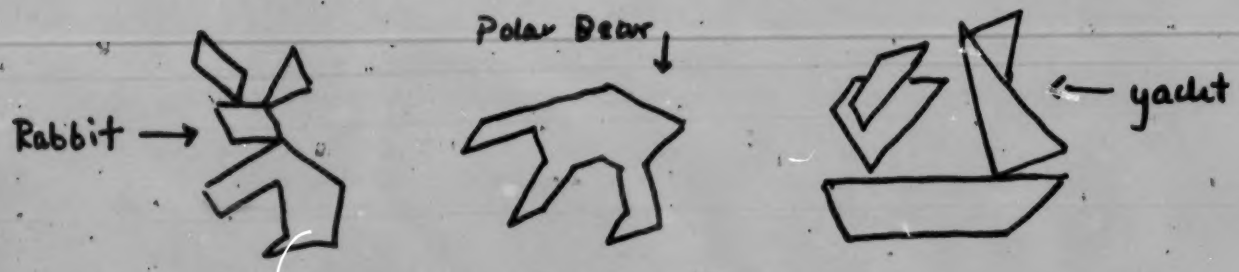
CREATIVITY: is the capacity to find new and unexpected connections among thoughts, ideas, and objects. Creativity in all art forms depends on one's own special approach to combining materials, movements, or sounds to produce an interesting or original picture, dance, song, idea, or experience.

ACTIVITY:

INTRODUCTION: Tangrams have only seven pieces, called tans. They are the simplest possible shapes and are used to make a variety of tangrams, placing a heavy demand on one's geometrical intuition and artistic ability. The single rule is that all seven tans must be used in creating every tangram. The tans are obtained by slicing a square to produce two large triangles, a middle-sized triangle, two small triangles, a square, and a rhomboid, as depicted below:



Tangram play can be used to depict silhouettes of animals, human figures, and other recognizable objects, with maximum artistry, or humor, or both. Here are several tangram pictures:



ACTIVITY:

Distribute colored rectangular sheets of construction paper to each student. Instruct students in the process of folding and tearing the paper in order to create the tan pieces pictured above. Have students try to fit together the seven tans to match the outlines of several geometric or representational tangrams you have already created and colored in on a large piece of paper posted in front of the room. The outline does not include the interior lines of the tan positions. The students must figure out how the parts fit together in order to create a duplication of the tan.

Have students create both representational and geometric tangrams to display in class. The students should make their own outlines, filled in, as are those displayed in front of the room, so that other students may try and duplicate their design. Students may wish to design and solve tans together, all the better for learners to teach other learners.

FOLLOW-UP DISCUSSION - EVALUATION:

Some students will have difficulty with the tangrams and will feel frustrated in their initial attempts. Encourage these students by giving them work on the more obvious tangram combinations. Lack of tolerance for math might provoke such a reaction among some students, so the geometrical phrasing of the introduction may be omitted. Discuss difficulties in piecing together the tangrams... Which seemed the most creative of combinations presented in class? Which the most difficult? Discuss content concepts and relate the tan activity to problem-solving in everyday life.

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DEVELOPING ALTERNATIVES FOR THE CITY

by Becky Kent

The following is a short scenario exercise enabling secondary school mathematics students to interrelate social and environmental issues with a group of math concepts. The scene is in the mid 1980's. Catalytic converters in automobiles have been found to give off a previously unnoticed gas known as 0 Zone 3. 0 Zone 3, although not especially toxic when isolated, possesses a great affinity for carbon monoxide. When combined, scientists find the two producing more of each other. The results of this are that:

For the third summer in a row, air pollution has reached a crisis point and electrical power plants are already strained to keep up with modern demands. All the leading Boston scientists have come to the conclusion that motor vehicles must be banned immediately. So the mayor and city council have ruled that on the first of next month, no motor vehicle of any kind will be allowed within the city limits.

What problems will this create? What alternate means of transportation can be found? The answers to these questions will determine the future of the city.

First we had better figure out what kind of turmoil we are going to be faced with. No cars, no motorcycles, no fire engines, ambulances, police cars or trucks, at least not in the present forms. How will garbage be collected? Mail delivered? Oil furnaces filled? Snow removed? If the MBTA is already working to capacity (because of the strain on electrical power), how will car commuters get to work? Shoppers get downtown? How will the export and import of goods to the city be carried on? What will take the place of bull dozers and other construction vehicles? How will students who take school buses get to school? Finally, what people will be forced out of work and how will they be taken care of?

These questions lead to some interesting survey and statistical tasks:

SURVEY 1: How many people presently commute to or through Boston? How many automobiles does this represent? What routes are most heavily traveled? What is the average distance a commuter rides? What is the average time of the trip? The average cost? To answer these questions the group should consider the merits of a random survey and of statistical information from insurance companies and the Motor Vehicle Department.

SURVEY 2: What area does the biggest Boston fire station serve? How many times in twenty-four hours are fire engines sent out? How far do they go? (A bell graph of the distances could be made.) How many minutes do they take to reach their destinations? Does rush hour traffic affect their times? Similar survey questions apply to police and ambulance service.

SURVEY 3: What is the volume of imports to the city each week? What is the weight? (Inquire of the Boston Commerce Commission.) What percentage of that presently comes by truck? What is the average capacity in weight and volume of trucks carrying imports to the city? What is the range of capacity and volume? How many trucks service the city in a week? What part of present imports consists of motor vehicles or parts for motor vehicles? The same information could be gathered on exports and heavy transportation within the city, e.g., moving vans.

SURVEY 4: How many workers could be forced to find other employment? What companies could go out of business or be forced to change businesses? People affected will include taxi and truck drivers, auto insurance employees, car sales, and servicing workers, parking lot owners and attendants, rent-a-car employees. A graph of the range and distribution of their incomes could be done to show what pay scales will be needed in newly created jobs to minimize social disruption.

SURVEY 5: Trash and garbage collection presents another problem. How many trucks now service the city? What is their capacity in volume and weight? How far do they transport city rubbish? How many families will one truck service in a day? Does this vary from private homes to apartment buildings? A survey of population density in different city blocks could be done to see which areas are likely to need more rubbish service. Does the present system give service on this basis or on some other? What part of the weight of a truck load of trash is glass bottles? Recyclable? What part of the volume of a load is cans? Crushable? Very approximate answers to these questions might be obtained by taking an average of answers given by many garbage collectors or by actually weighing and measuring some sample barrels of trash and using that information as a proportional sample of a whole truck load. Another important question, which applies to all vehicles that carry heavy loads, is how much horse power does the truck have? And what is meant by "horse power"?

Other similar surveys could be done on mail delivery, busing of school children, construction of buildings and roads, snow removal, etc. The possibilities are interminable so I'll let these examples suffice while we go on to consider the alternatives to motor-vehicle transportation.

OTHER WAYS TO GET THERE

Let's first use our imaginations to make a list of all the ways of getting somewhere without a motor. There is walking, roller skating, ice skating, bicycling, tricycling, and unicycling. You can canoe, row, sail, or take a canal barge. There are donkey carts, horse carts, ox carts, and sailwagons. Pedicabs, rickshaws, horses, and blimps. Skis, scooters, ice boats, and paddle boats. Pogo sticks, wagons, skate boards, wheel chairs, and gliders. The hackney coach and the fire balloon. And finally, you could try a new invention - a sun-powered car, a bus-bike, or a variation on the ski lift.

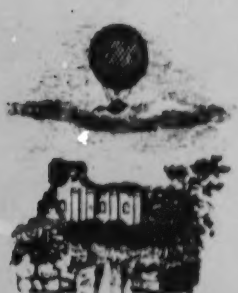
Whatever the list consists of, the next problem is to decide which "ways to get there" are good ones and what they are good for. (Just as it doesn't make sense to take a twenty-ton truck to an office in Kenmore Square, it may not make sense to take a canal barge to school.) The different means of transportation could be grouped in sets according to attributes, such as those that depend on weather, with sub-sets for those that require certain wind velocity, and others that require certain temperature range. (Iceboats and sailboats form the intersection of these two subsets.) The list could also be divided according to the speed of the vehicle or according to the weight of the load it could carry. Then, to find a one-person vehicle that will go twenty miles an hour, the intersection of the set of one-person vehicles and the set of twenty-mile-an-hour vehicles will yield the appropriate means of transportation (See table 1 and diagram 1.)

Every form of vehicle must then be categorized according to general criteria that apply to all of them. These criteria include speed, initial cost, cost of operation, type and quantity of fuel, capacity in weight and volume, appropriate load, appropriate operating conditions, directional control rating, and deceleration rate. To thoroughly investigate all of these properties, a variety of activity is needed.

Let's look at the pogo stick. Determining the speed of a pogo stick will require some testing and application of rate-time-distance equations. Since it is powered by human energy, some unit for measuring quantity of human energy expended will have to be developed. This will require a great deal of problem-solving skill because of the wide range of energy and muscle development among people. To simplify the problem, the group may wish to choose a guinea pig and determine all human energy problems in terms of his energy. Another possibility is to use pulse rate increase as a determiner of expended energy. Establishment of a directional control index introduces angle measurement. Can a pogo stick jumper make a right angle turn? A 135 degree turn? A 180 degree turn? How much area does he need to do it? The answers to these questions will determine appropriate operating conditions. (Should pogo sticks go on sidewalks?) A final important consideration:

how long does it take to stop, going at top speed? What about going down a 30-degree incline? All of these questions can also be applied to cycles, roller and ice skating, horse-back riding, walking; and many of them can be tested first-hand.

More difficult to test, but still interesting to explore, is the possibility and practicality of balloon transportation. Two types of fuel have been used to elevate balloons—hot air and gases (hydrogen and helium) lighter than air. The use of these methods provide some good scientific inquiries: Why does hot air serve to elevate the balloon? How hot and how much air must you have to life one pound? Ten pounds? 1000 pounds? (Small scale experiments might be conducted with an alcohol burner.) "How much air" brings up the problem of finding the volume of a sphere. If you wish to double the volume, how will you change the diameter of the sphere? And in determining cost we must consider the amount of materials (linen, silk, and plastic are most common) needed to make the balloon, i.e., the surface area of the sphere. Since the material the balloon is made of obviously must be included in the weight the balloon will have to carry, we will also want to know if surface area increases in direct proportion to volume or not. A graph showing the proportion of increase of surface area with each increase in diameter could be compared to a graph of the proportion of volume increase with each similar increase in diameter. And, of course, the larger the balloon, the more complex the task of keeping the air in it hot. Fire balloons, which carry the fire for heating the air under them, have been tested. But presumably, the bigger the balloon the more fuel needed... or is that true? Do the balloon volume and the fuel needed to support it increase in direct proportion? And does the balloon need more fuel at high altitudes, where the air is cooler?



Steering is another important aspect of balloon flight. "Wings" can be attached just under the balloon. What is the directional control rating for a balloon traveling at top speed? For that matter, what is top speed for a balloon? Does speed vary with weight? What wind conditions are optimal for balloon travel? Does that vary with weight? Is directional control better when the wind is moderate, light or heavy? Why?

What is the largest and heaviest load that can be balloon-transported with safety and accuracy? Why? Answers to this question may vary, but the problem encourages the consideration of what happens to the graphs of volume, surface area, fuel, and directional control as the diameter increases toward absurdity. Is it theoretically possible to create a usable balloon of any size?

Other balloon topics include use of sandbags, parachutes, different air temperatures, valves for descent, time needed for inflation, optimal altitude, and so on. But let's go on.

Horses and horse-drawn carriages may offer some very practical, if old-fashioned, transport possibilities. How does riding from the Prudential Center to the Boston Common compare in time to driving? What is the cost of feeding a horse for a year? How does that compare with the maintenance of an automobile? Areas for posting horses during the work day would have to be arranged. Could present parking lots be converted for this purpose? What are the new employment possibilities open to a city that uses horses and perhaps other animals? If the present-day car commuters converted to either horses or horse-drawn carriages which average three passengers per carriage, how many horses would have to be posted in a day if: a) half of the commuters came in carriages and half on horse back, b) all commuters came in carriages, c) three-quarters of the commuters came by carriage?

A survey could be done of the different types of horses, their costs, and their strengths. What load can each type carry comfortably on his back? What load can he pull on wheels? Does wheel size affect the ease of pulling? What is the effect of inclines of different degrees on the weight of the load? If horse carts are to use our present roads, what should be the maximum width of a cart? How does the length of the carriage affect the area needed to make a 90 degree turn? A 180 degree turn? So what should be the maximum length?

Canal barges yield more possibilities and more problems. What material should barges be made of? This question suggests some sink-and-float experiments. How much weight can a barge 50' x 50' carry and still float? Does it matter how thick it is? Does the distribution of weight on the barge matter? How deep should the canals be? Will tides affect their depths? Will they have to be below sea level? How far down is that in different areas of the city? Perhaps locks will be needed. How much water will they have to hold? What will that weigh? How will the force of the water be distributed over the walls of the lock when full? What cargoes might you wish to transport by barge? What size barges would you need? How wide should the canals be to accommodate two-way barge traffic? How could barges be propelled? How fast would they go? Will weather affect their use?

Some of Papy's "taxi distance" problems could be explored through pedicabs. Pedicabs are carts pulled by the work of a cyclist in front. What routes might a pedicab driver take from the Greyhound bus station to the B.U. bridge? He may wish to avoid hills. How will that affect the distance he must ride? When "balloon distance" is compared to "pedicab distance" one result may be the Pythagorean formula for the length of the hypotenouse of a right triangle. (See diagram 2). Of course, the speed of the pedicab should also be compared to the speed of the balloon (which will depend on the wind). With this information, a table or a graph could be made comparing the time various trips would take by balloon to the time they would take by pedicab.

Topological problems arise when traffic regulation is considered. Will all vehicles use all roads? How will different rates of vehicles be accommodated? Slow vehicles might stay in the right lanes, but then how will they make left turns? Should one-way streets remain one-way for all vehicles? Some vehicles? Should certain roadways exclude slow vehicles? Are there some places where only narrow vehicles, like bicycles and horses, should be allowed? Detailed maps could be made of the traffic routes and the regulations for them that would best accommodate in small parts of the city.

As a conclusion to this project, a prognosis should be made. What is the future of the city? Are there enough new opportunities to accommodate the jobless? Can the city still import and export all it needs for survival? Can emergencies be handled adequately? Will the transportation of people be adequate? Can construction continue at its present pace? After all the figures are collected and considered, the problem becomes one of individual judgment. What are the advantages of the new transportation system? Do they out-value the disadvantages?

Meanwhile a load of math has been covered. We've tried random sample surveys, found averages of all kinds, and created several graphs from our information. We have considered rate-time-distance problems and volume and weight in many sizes and shapes. Percentages and proportions have been used to compare figures and clarify problems. Population density and horsepower concepts were employed. Use of set theory offers the best means for evaluating our new transport vehicles. Measurement of time, distance, weight, speed, temperature, angles, and even "human energy" are used throughout. In balloon theory, we considered direct and indirect variation. And algebraic solutions are implied in the problems of commuters using horses and horse-drawn carriages and the distribution of water pressure over the wall of a lock. The topographical problems of a pedicab driver were compared to those of a balloonist and Pythagoras' theorem was used. And more mapping projects evolved out of traffic analysis.

Obviously, the activities suggested here are not intended to be all encompassing. We encourage you to adapt this exercise to your own grade level and geographic situation. The following tables are to further assist you in the development of this exercise. We look forward to your response.

TABLE 1

	SET A	SET B	SET C	SET D	SET E
Top speed:	0-5mph	6-10mph	11-15mph	16-20mph	21 up
Vehicle:	foot donkey wheelchair	scooter barge rickshaw paddleboat	canoe horsecart sailboat ox cart	pedicab skating sailwagon bus-bike	horse balloon 10-speed bike iceboat coach

	SET F	SET G	SET H	SET I	SET J
Passengers:	1	2	3	4	5 and up
Vehicle:	foot horse bike wheelchair scooter rickshaw skating	canoe pedicab paddleboat donkey	sailboat iceboat sailwagon	coach	balloon bus-bike horse cart ox cart barge

DIAGRAM 1

What vehicles can carry the most passengers and go the fastest.

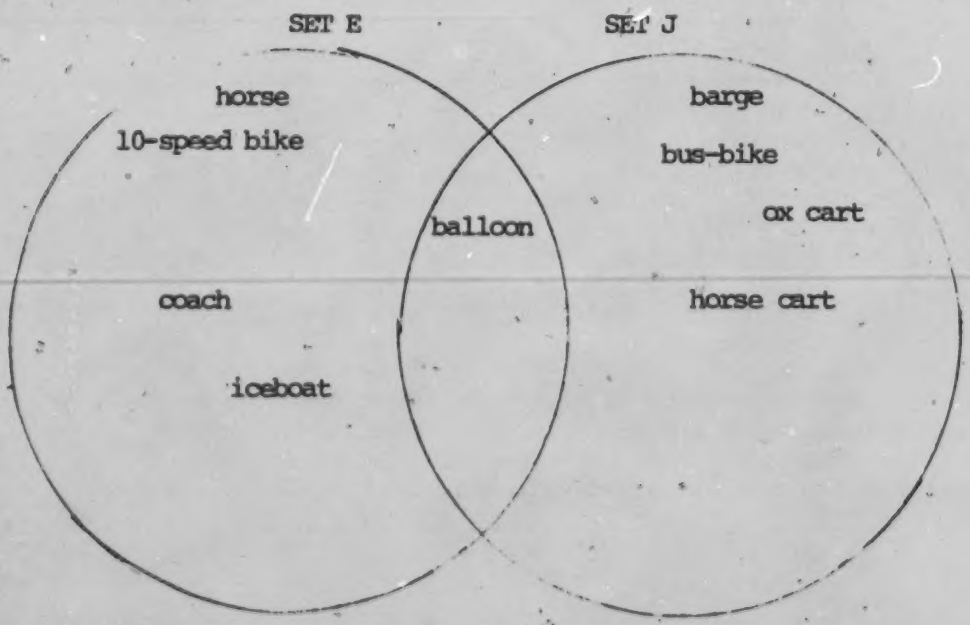


DIAGRAM 2

How does pedicab distance compare with balloon distance?

"Pedicab distance" is the length of AB plus the length of BC.
"Balloon distance" is the length of AC plus two times the altitude. But since AC cuts through buildings, it may be easier to use the Pythagorean theorem. So

$$AC = \sqrt{(AB)^2 + (BC)^2}$$

SUN SENSE AND SCIENCE

Jim Masker

As an educator, I find solar energy to be especially relevant in the classroom today because it allows students to be involved in a process that is as old as human history itself - "Sciencing." Too often the extent of science curricula is learning about scientists and replicating experiments which have the "correct" answers contained in the teacher's edition edition, rather than actually participating in the painstaking hypothesizing/testing/rehypothesizing experience that real life scientists go through as they attempt to find optimum solutions to real life problems.

A necessary part of sciencing and perhaps educationally on the more significant tools for student growth is the realization that in areas where experts have yet to determine optimum parameters, every blind alley or unsuccessful experiment is as valuable in learning how to do something as is a continuous string of "right" experiments. In fact, one can only begin to delineate appropriate from inappropriate information after a considerable number of experiments have shown what procedures lead to optimum results.

The body of knowledge about solar energy has yet to be finalized and because it is by nature open to non-technically sophisticated research, it is ripe for sciencing, especially by lower and middle school students who are constantly exploring and being inquisitive about their environment. Teachers should not hesitate to expose their students to solar energy simply because they themselves do not understand all there is to know about the topic. It might make a unit on solar energy even more meaningful for the class if they can actually see their teacher reaffirming the notion that learning can and should be a never ending, continuous process which does not end beyond the diploma.

The following is a two part explanation of how you and your class can begin the process of sciencing in this new and valuable field. Part One explains the basic principles of how solar energy works and how to construct an inexpensive solar collector. Part Two presents an experiment to test your collector, a list of potential variables for which the class may want to experiment, and finally, some activities that might heighten the educational impact of the experience for the class.

Part One

A. Principles - Most solar collectors throughout the world are based on the same fundamental principles. Once you understand these principles, to optimize your collector design is the purpose of further sciencing.

2. Procedure - Cut the tin cans so that they unroll and flatten into a rectangular sheet when pounded with the hammer. Cut and piece the flattened cans until they fill the bottom of the boot box without overlapping.

Put three coats of paint on the cans and let them dry thoroughly after each coat.

While the cans are drying, cut a hole approximately 1/4 inch wide in the middle of one of the shorter sides of the boot box. If you have a square box, cut the hole in the middle of any side (see diagram below). This will be where the thermometer will be placed during the experimental phase.

Once the cans have dried, place a more than liberal amount of Elmer's glue on the bottom of the boot box and place the cans painted-side up on the glue. Place the books on top of the cans to weight them down and allow to dry overnight.

Tape the piece of polyethelene over the top of the boot box, being certain it is taut and wrinkle free.

Part Two

A. Experiment

1. Materials -

- solar collector
- a laboratory thermometer
- a stand to rest the collector against and a test tube holder that fits over the stand and holds the thermometer securely
- a stop watch or a good watch with a second hand
- a piece of notebook paper and a pencil
- a piece of graph paper

2. Procedure - Being careful not to let any direct sunlight fall onto the collector, set up your apparatus as in the diagram below. Do not let the bottom of the thermometer touch the bottom of the collector. Try to insert it at least 1 1/2 inches into the collector.

Once you have set up the apparatus properly, have a student record the temperature inside the collector before exposing it to direct sunlight. Then, expose the collector to the sun, checking to make certain there is as little shadow on the metal bottom as possible.

Have the person keeping the time tell the student watching the thermometer when a minute has passed. Another student should record the temperature on the sheet of notebook paper. Record the temperature every minute for at least twenty minutes.

Repeat this procedure at least once more on another sunny day.

Taking the recorded temperatures, have your students make a graph of their results. The horizontal axis is labelled time, while the vertical axis is labelled temperature. Discuss the findings.

B. Other Variables - Remember that the goal of this sciencing effort is to optimize the amount of heat generated while minimizing the heat loss. Therefore, it is conceivable that your students could be broken into research groups to test for certain variables. The list provided below is offered as a suggestion. Students should be encouraged to think of variables themselves.

- try different materials for the sun to strike; both metals and non-metals
- what transparent material is optimum?
- what color paint and how many coats is most efficient?
- does insulation make any difference?
- does the shape and volume of the box make any difference?

C. Activities -

1. Get speakers from local colleges, PIRG groups, etc. to come to your class and speak on topics associated with energy.
2. Take field trips to solar heated structures.
3. Look at the books listed in another article in this issue titled, "A Bibliography of Energy Related Books" for other possible activities.
4. Start a bulletin board in the hallway for solar energy articles and experimental results.
5. Present your findings to a school assembly.
6. Have your students be "expert" guest lecturers in other classes.
7. Organize a parent's night with displays and oral presentations.
8. Have your students write articles for your local newspaper or television station.
9. Publish a small "scientific" journal of the classes' findings.

1. Principle One - When sunlight strikes an object, whether solid, liquid, or gas, it tends to heat the object. Briefly, this happens because the sun's energy (sunlight) tends to excite the atoms and molecules of the particular object. This excitation causes friction between the various atoms and molecules which results in what we understand to be heat. Because of their density and light absorbing qualities of their surfaces, different materials will react to the sun's energy by giving off various amounts of heat.

   NOTE: Students usually have internalized and understand this principle without necessarily having to verbalize it. This is because they have been sciencing since birth but have not always been told this is what they were doing. A couple exploratory questions should let you know whether or not some introductory sciencing will be in order. Ask them if they have ever walked in their bare feet during the summer on a black top road or whether or not they have ever sat on a car seat that has been exposed to the sun.

2. Principle Two - Heat rises. This can be determined by having students hold their hands two inches away from the side and then the top of a 100 watt bulb or a candle.

The basic structure of a collector, therefore, is to provide the sun with a material to strike in order to produce heat and a structure to contain the heat that is given off. The goal of the classes sciencing efforts should be directed toward determining the optimum materials and construction necessary to create the greatest amount of heat while losing as little heat as possible.

B. Building A Collector -

1. Materials -

- large boot box (approximately 11 inches by 16 inches) from a local shoe store
- several tin cans with the ends and paper removed
- a piece of transparent polyethelene large enough to cover the box with 1 1/2 to 2 inches extra on all sides
- a can of dark green metal paint and a brush
- glue
- a pair of tin snips or some other metal cutting device
- scotch tape
- hammer
- a pair of scissors
- several heavy books that fit inside the boot box to be used as weight

ENERGY ON THE BOOK RACK

Jim Masker

The books described below are all found on the shelves of popular bookstores and are presumably available or can be easily ordered from stores in your area. After listing the salient data needed to locate the books, I tried to remove a significant quotation from the preface or introduction of each that, in my judgment, sets the tone for the theme and style of each book. Finally, I have tried to summarize the format and usefulness of each in such a way as to provide a rough estimate of the book's relative value to you.

Clark, Wilson, Energy for Survival: the Alternative to Extinction. Garden City: Anchor Books, 1975. 652 pages. $4.95.

> "... the essential message of this book (is)... that our high energy, industrial way of life is extremely vulnerable to energy disruption, and that our way of life must be changed in order to survive the pressures of the future."

A lavishly documented volume, with forty-eight pages of bibliographical reference at the end, which succeeds in proving that our dependence on fossil and nuclear fuels is less than hopeful. Clark clearly spells out how energy is used for industry, transportation, agriculture and homes, how this historically came to be, and how our culture and the world will necessarily be undergoing profound changes in the coming years. He calls upon government to begin sponsoring alternative energy research but recognizes that regardless of how quickly research begins in earnest we must still anticipate less available consumable energy. The last half of the book explains the practicality of solar and wind energy. Wilson concludes, "It is encouraging that the possibilities for change have never been more viable in society, and that from the troubling times of the present, a new consciousness must emerge, to bring forth a new Enlightenment from an age of enchantment with the Dynamo."

This is an extremely scholarly and analytical volume, providing hundreds of facts to use in support of a belief in the energy crisis.

Eccli, Sandy, Alternative Sources of Energy: Practical Technology and Philosophy for a Decentralized Society. New York: The Seabury Press, 1975. 278 pages. $7.95.

> This volume is a compilation of articles from the first two years of the Alternative Sources of Energy Magazine. "The

idea of A.S.E. started when Don Marier put an ad in Mother Earth News almost three years ago, seeking contact with other people interested in solar, wind, and water power... he saw A.S.E. as a forum where people could exchange experiences."

The book does just that in 210 articles divided into three major headings of Technology, Building a Network, and Philosophy. The articles range from book reviews, to philosophical explorations, to actual "How I tried to..." type of pieces. It concludes with a lengthy yet somewhat unsophisticated bibliography, listing a few interesting references.

I would not use this book as an introduction to the "state of the art" but found it very useful as a browsing tool. Again, it has a reader/writer format and is valuable in that it shows that virtually anyone can experiment successfully with alternative energy sources. One really gets a sense that real live people are on the other end of the typewriter. Students would probably enjoy this because nearly every article welcomes responses and an exchange of ideas.

Daniels, Farrington, Direct Use of the Sun's Energy. New York: Ballentine Books. 1976. 271 pages. $1.95.

"The purpose of this book is to interest scientists and engineers in undertaking research on the direct use of the sun's energy... In an effort to interest readers who are not specialists in solar energy, many engineering and technical details have been minimized."

This volume is sectioned into nineteen easily readable chapters which cover every topic concerning solar energy imaginable, from a brief history of the use of this energy source to a description of how it can be applied to heating, power, distillation of water, refrigeration, cooking, etc. Excellent bibliographies accompany each chapter so that those who want more technical details can locate them. Those who don't necessarily need the detailed aspects of solar energy can find the book extremely useful, but not boggling.

The overall tone of the book is that solar energy has numerous potentials to help alleviate the impending energy shortage. Even the briefest perusal of Daniels' book will make one a believer.

Gabel, Medard, Energy, Earth, and Everyone: A Global Energy Strategy for Spaceship Earth. New York: Simon and Schuster, 1975. 160 pages. $4.95.

"Energy, Earth, and Everyone documents a World Game Workshop... The group sought not simply to understand what is going on and

what the problems are, but also to identify, through a specifically stated set of values, what should be, and what the group could do to bring this preferred state."

A comprehensive, exceptionally informative "notebook" outlining in three richly mapped, diagrammed, and charted sections what the nature of energy use is today including the dynamics of energy usage, what sources are available to us, and a final section on "Global Energy Development Strategy." Half the book is devoted to twenty-two realized and potential energy sources, explaining how each method works, its advantages and disadvantages, and where each source is located or could be deployed. The references at the end of each of the three sections plus the detailed listing of "Energy Related Organizations" provides a wealth of potential resources for further research.

This volume is excellent for providing an overall perspective of the energy problem, but doesn't get involved in all the math and technical details one would need to build models of the various energy sources. Gabel's book would make an excellent classroom tool.

Hayes, Denis, Rays of Hope: The Transition of a Post-Petroleum World. New York: W. W. Norton and Company, Inc., 1977. 240 pages. $3.95.

"Rays of Hope is an early effort to explore the shape of the post-petroleum world and how we get here to there. The book's great strength is its perspective, historical and global. Denis Hayes helps opinion leaders and decision-makers at all levels to see how the energy problem will become the energy crisis if action is not taken quickly."

Lester Brown, President
Worldwatch Institute

Probably the most meaningful $3.95 investment you can make this year! Hayes does an incredible job documenting and explaining exactly what the problem is today with energy and where we might and should look for solutions. His chapter entitled "Nuclear Power: The Fifth Horseman" is probably one of the most compelling pieces about nuclear power to date. Hayes also spells out the impact a change to alternative energy sources could have on values and lifestyles, and how the transition could or could not be relatively painless depending on the decisions "vested interests and inert bureaucracies" make in the next few years.

If one book should be read about the energy crisis, this one is it. Teachers looking for a "textbook" would do well to start here.

Staff of Mother Earth News, The Mother Earth News Handbook of Homemade Power. New York: Bantam Books. 1974. 374 pages. $2.25

> "The following pages... are packed with information about alternative energy systems that really work and that you can put to work right now... today! Yes, there are answers to the developing energy crisis... and you hold a rich collection of those answers in your hand at this very moment."

This is one of the most "energizing" energy books on the shelves. It shortcuts all technical jargon and explains in five chapters devoted to wood (11 articles), water (11 articles), wind (6 articles), solar (8 articles), and methane (8 articles) how to do just about everything with your own hands with very little capital outlay. Sometimes the explanations are a bit sketchy but this does not detract from the overall effect. One definately can become a local Mr. Wizard with this compact volume. A very enjoyable and readable book.

Portola Institute, Energy Primer: Solar, Water, Wind, and Biofuels. Menlo Park: Portola Institute, 1974. 200 pages. $5.50.

> "We set out to write a book about renewable energy systems that people could use themselves; a description of how they work, their limitations and potentials and the hardware and techniques necessary to grow, build and maintain them."

Very richly detailed chapters on each of the various potential energy sources mentioned in the book's title, as well as a chapter on Architecture and an interesting section on Integrating Systems. There is an extremely useful page of volume, weight, and size conversion charts. The format for each chapter is to explain the essential fundamental principles with diagrams and lengthy written pieces, followed by several pages of essential facts and figures in graph and chart form. This is then proceeded by a page of terms and definitions, with each chapter being completed with a number of useful addresses, books, and products.

The overall effect is to leave one with a feeling of competency in alternative energy sources. This book would be helpful to anyone wanting to pick up one easily readable publication. Any teacher in planning a unit on renewable energy potentials should include this in a reference collection.

Stoner, Carol H., Producing Your Own Power: How to Make Nature's Energy Sources Work for You. New York: Vintage Books, 1975. 322 pages. $3.95.

"The contributors (to this volume) are many people who have been creating all the excitement about "home-made" power. They are scientists, engineers, architects, educators, and homesteaders... They came together here to discuss the limitations and potentials of small scale power production."

This book begins with a concise, clearly- worded, six page summary of why we have an energy crisis today, why nuclear power is not going to help, and how we are just beginning to recognize that other less destructive forms of energy are more readily available once we learn how to tap them. The various authors go on to explain the basic principles of each regenerative power source, the good and bad points of each source, and the facts and figures one would need to know. Each article is well diagrammed and educational. The Appendix includes an excellent list of where to write for products and information, as well as a well documented and very useful bibliography. Also included is a series of conversion tables and a four-page glossary of essential terminology.

This is one of the more useful introductory books on the topic of alternative and regenerative energy. A non-technical reader will find this a helpful volume and teachers would probably want to add it to their classroom resources.

ENERGY EDUCATION MATERIALS: A PARTIAL LISTING

Cathy Horvitz and Robert Kahn

The following partial listing is offered in the hope that it will prove helpful to teachers preparing to address energy issues in their classrooms. We have included curricular materials appropriate for both elementary and secondary students.

Our list is incomplete for two reasons: 1) the entire field of energy education is so new that additional materials are being generated swiftly and it is difficult to keep pace with them, and 2) so much bad pedagogy has been perpetrated in the name of energy education (e.g., by utilities, state departments of education, and so on) that to include poor materials is senseless.

Our review of currently available materials has led us to several conclusions, probably unsurprising to readers of the FII: (1) the better materials are those prepared by classroom teachers or naturalists, and (2) the broader the outlook and more diverse the methods of presentation, the more effective the material. All too often, energy education materials are not more than educational materials about fuel and are usually limited to those activities. Furthermore, (3) there is a great deal of repetition; "home energy audits," for example, must appear in every other curriculum we have reviewed.

What follows then is two peoples' list of useable energy curricula. Without a doubt this new area is a rich vein, particularly for those educators with a futurist bent. The onrush of these materials is only the beginning, and it will probably be some time before the faddists leave the educators alone to do their job in energy education.

We offer these materials as guideposts to help develop your own pedagogical tools without repeating some of the better work that has already been done.

ELEMENTARY AND MIDDLE SCHOOL AGE

TILLY'S CATCH: A SUNBEAM COLORING BOOK, Solar Service Corp., Cherry Hill, NJ 08002, 1976.

Surprisingly informative for elementary age children, a fun introduction to solar energy produced by a Solar firm. Teacher's guide available upon request.

NATIONAL SCIENCE TEACHERS ASSOCIATION-ENERGY ENVIRONMENT MATERIALS PROJECT, 1742 Connecticut Avenue, NW Washington, D.C. 20009.

These materials - a steady stream of which began as far back as 1974 are diverse, slick, and occasionally stiff. Still, their bibliographies for K-9 are useful as are their background information for teachers. Lesson plans also available.

IT'S OUR FUTURE, ECOLOGICAL SCIENCE SERIES, Globe Book Co., NY, 1976.

Children's textbook out of an excellent series. Here the themes are the interactions of energy in the natural and man-made world, energy as transformation, the role of science in understanding nature.

ENERGY FROM THE SUN, Melvin Berger, Thomas Crowell Co., NY, 1976.

One of the "Let's Read and Find Out" series with illustrated descriptions of how all forms of energy on Earth originate from the Sun. Supplementary readings for ages 4-8.

"The Magic Energy Want," Cathy Horvitz, FII, Fall, 1976 issue, Future Studies Program, UMass, Amherst, MA 01003.

Activities with which to explore energy in natural and temporal contexts.

SOLAR SCIENCE PROJECTS, D.S. Halacy, Scholastic Book Services, NY, 1974.

A thin paperback with lots of simple ideas and plans to demonstrate solar energy, such as solar stills, cookers, solar-powered radios, etc. Probably applicable through Middle School and a bit beyond.

GREEN BOX, Humboldt County Schools, Office of Environmental Education, Eureka, CA 95501, 1975.

One of the best! A hefty box with excellent activity cards for a comprehensive environmental education program. Heavy infusion of energy-related activities. All elementary grades.

ALL ABOUT ENERGY, Richard Dalton, Dow Chemical Co., Midland, MI 48640.

For elementary age groups, featuring comprehensive introduction of energy sources. Colorful pictures.

"THE CURIOUS NATURALIST" Massachusetts Audubon, Lincoln, MA 01773. 1974-1975 edition.

During the 1974-1975 academic year, this excellent magazine featured a series on energy, particularly as applied to natural systems. Especially good for use with younger children but applicable for all age groups.

"RANGER RICK'S NATURE MAGAZINE" Natural Wildlife Federation, Washington, D.C., monthly.

Monthly magazine for elementary age group, often featuring energy related material. Ask specifically for "The Best Present of All," (free) a play about choosing from among energy sources.

SECONDARY

THE HOUSEHOLD ENERGY GAME, University of Wisconsin, Sea Grant College Program, 1800 University Avenue, Madison, WI 53706, 1974.

One of the better attempts to help students record how much energy their families use at home. Suggestions for conserving energy are offered.

ENERGY AND ORDER: A HIGH SCHOOL TEACHING SEQUENCE, Friends of the Earth, San Fransisco, CA, 1974.

This curricula for science classes explores the implications of such intractable and fundamental energy laws as entropy. Loaded with interesting experiments. Clearly presented.

ENERGY AND ENVIRONMENT: FOUR ENERGY CRISES, G. Tyler Miller, Wadsworth Publishing Co., Belmont, CA 94002, 1975.

Paperback excerpt from Miller's superb textbook, LIVING IN THE ENVIRONMENT. Written for undergraduates, the book can be used as a transdisciplinary focus for teaching advanced high school students about the energy question or as background for teachers.

ENERGY BASIS FOR MAN AND NATURE, Howard and Elisabeth Odum, McGraw Hill, NY, 1976.

Howard Odum has earned a widely respected reputation as one of the better informed energy experts. In this book the Odums successfully attempt to translate concepts such as "net energy" for use in high schools and the general public.

ALL AGE GROUPS

CREATE TOMORROW TODAY, Energy Awareness Program of the Washington State Superintendent of Public Instruction, Olympia, WA 98504, 1974.

Early and often copied; with good materials not only for students but useful background for teachers and administrators.

ENERGY AND MAN'S ENVIRONMENT ACTIVITY GUIDE, 0224 SW Hamilton Skyline Building, Suite 301, Portland, OR 97201, 1974.

Another early and influential resource. Over 100 pages in length the guide for elementary through secondary was prepared by educators from three Northwestern states. Values issues associated with energy are offered along with a teacher-oriented bibliography and technical glossary.

THE REASONS FOR THE SEASONS, Linda Allison, Little, Brown and Co., Boston, 1975.

A wonderful book featuring legends, information, and simple activities focusing on nature's energies expressed in seasonal variation.

FAMILY ENERGY WATCH CALENDAR, State of Oregon, Department of Energy, Salem, OR 97310, 1975, 1976, 1977.

Facts, graphs, pictures, and lots of things to do everyday. All ages.

ENERGY ACTIVITIES FOR THE CLASSROOM, Herbert Coon, Ohio State University, Educational Resources Information Center, 1200 Chambers Road, Columbus, OH 43212, 1976.

Materials for grade levels K-12. Simulations, experiments, measuring activities.

ENERGY AND THE ENVIRONMENT, State Office of Environmental Education, Tallahassee, FL 32322, 1976 and 1977.

Developed by working teachers, these collections are among the best. Cutting across disciplines where necessary, the offerings here take a comprehensive and wholistic view of the environment.

LIVING WITHIN OUR MEANS: ENERGY AND SCARCITY, State University of New York, State Department of Education, Albany, NY 12224, 1975.

Two volumes covering grades K-12. Material for use in Language Arts, Mathematics, Science, Social Studies, and Home Economics classes are offered. Also included is a multi-media list of available energy education materials.

ENERGY ACTIVITY GUIDE (1976) and ENERGY WORKBOOK FOR PARKS (forthcoming), The National Parks and Recreation Association, Energy Conservation Project, 1601 North Kent Street, Arlington, VA 22209.

FUTUROWORD

Edward Rappe

One of the tasks for Future Studies courses is to improve the ability of the students to communicate. Communication in the future will assuredly be different than it is today. One way to develop students present and future communication processes is through the activity called "Futuroword."

The cultural exchange we have with the future is much the same as the cultural exchange we have with foreign cultures. The initial problem of cultural contact is that of communication. A new language must be learned as an aspect of a new culture. The interpreters/translaters of the future are people who master a number of language and concept combinations in order to survive. The same role is used with individuals who move into the future. They must learn to transform the language of today as a result of the influx of a myriad of new ideas to develop. One "future language" is that it generally comes into being much more slowly than an entirely new language in a new culture.

"Futuroword" is an attempt to introduce high school students to the concept of word formation, construction, and usage in the present as useful guides for future language communication. The explanation of prefix, suffix, and root word is not completely understood by all students; it would be of use to re-teach these concepts to students to assist them in understanding the new combinations the future will present.

The intent of "futuroword" is to improve the students skills with language and prepare them for adjusting to the future with a minimum of trauma. The mass of evolving new words and their arrangements is overwhelming to the layperson. (Layperson is such an example of culture change.) A study of word evolution demystifies the labelling of change in our culture.

The "game of futuroword" assists students in the future in the present. First, students are to translate a "futuroword," assigning it a meaning. There are any number of allowable meanings. (Encouraging teacher flexibility.) The second step encourages the students to use what they have learned by developing a vocabulary of prefixes, suffixes, and root words, and designating them as "futurowords." Resultingly, a three-fold effect. The students learn to use their language more carefully in the present, to conjecture on words providing images of possible futures, and to discover or create new ideas or future events by combining old parts of words.

Word-Sheet

Instructions: Briefly state a possible definition to each of the following New words.

1. Ecotactics -
2. Technostructure -
3. Tempostructure -
4. Telemeter -
5. Chemotherapy -
6. Envirometer -
7. Moonling -
8. Poppulution -
9. Minibus -
10. A MooBus -
11. Controlife -
12. Edujection -
13. Refusevac -
14. Thermalwalks -
15. Monoureaucracy -

Instructions: Create a new word to describe each of the following ideas listed below. (Can not be an existing word)

1. A train which travels under the oceans floor.
2. A new type of mechanical heart.
3. A large more efficient human brain.
4. Immortality of the human body through freezing.
5. Any type of future sport.
6. A catalogue for body parts.
7. A new concept of using the sun's energy.
8. Custom ordered body parts.
9. A boot used to walk on the ocean floor.
10. A new method of controlling the weather.

In order for a "futuroword" exercise to work, the teacher should have certain "tools" on hand. The first and foremost with any class is the mental attitude or mind of openness set. The class must be prepared to do something comparable to a "Scrabble" game of words. They must understand the possibility of uselessness in creativity; they must understand the joy of foolishness and spontaneity in creativity.

Other tools are dictionaries and encyclopedias; those with Greek and Latin rootwords assist word dissection and lead to more creative options for word combination. The reference shelf of the school library is also of use. Another source for "futurowords" is "The American Heritage Dictionary of the English Language." The appendix in the back on Indo-European Roots adds a helpful dimension on word construction and demolition. With these research aids, students can make word constructions for a number of root words. The only thing to avoid now is the students' attempts to manufacture an advertisement term without resorting to the word constructed of prefixes and suffixes.

In order to provide some practice try to translate the following few terms. Remember—there is no one correct answer.

What do these words mean?

Edujection
Environmeter
Tempostructure
Chemotherapy

What is the futuroword for each of these definitions:

A catalogue of body parts
A machanical heart
A machine that stimulates the mind
A chemical to control weather

There are, of course, many more. Try them on your students. The exercise sheet which follows gives you more potential "futurowords" with which to creatively explore language and culture change.

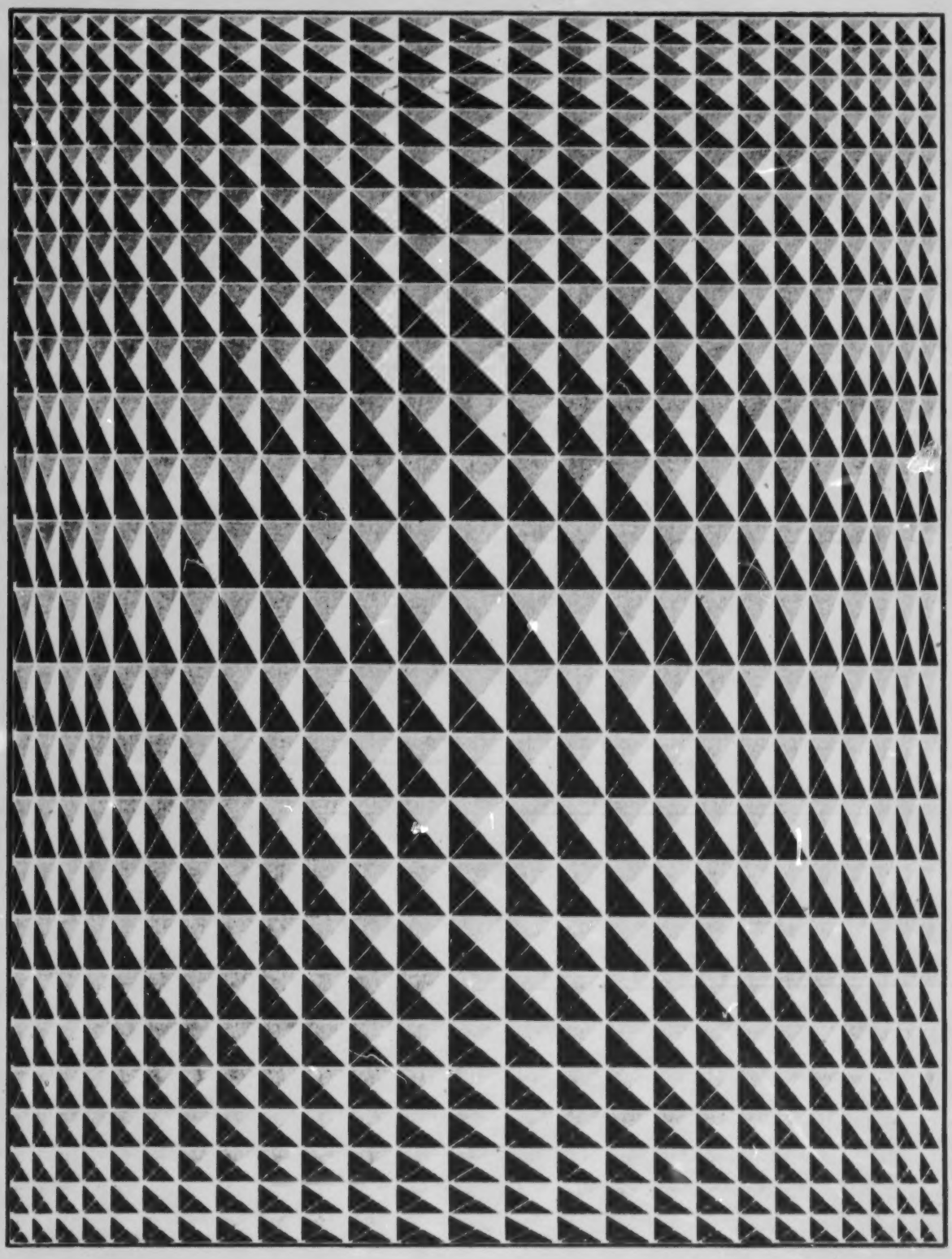
MAY 1 3 1979

The Best From Futures

Information Interchange

Future Studies Program
School of Education
University of Massachusetts, Amherst

1978



The Futures Information Interchange Newsletter is a collection of practical teaching methods and learning activities for introducing future studies into the classroom. Although the newsletter is directed toward primary and secondary school teachers, it is intended to be of value to educators at the pre-school and university levels also. Contributions to the Newsletter: the newsletter staff welcomes any specific materials related to your future-oriented work in the classroom that you would like to interchange.

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Consulting

The Future Studies Program has qualified graduate students who are available to schools, non-profit organizations and governments. They will bring educational strategies, audio-visual materials, and curricular materials upon request. Terms of employment are negotiable. For further information, contact Robert Kahn, Future Studies Program.

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Graduate Admissions

The Future Studies Program is searching for persons interested in enrolling in the program as graduate students for future admission. Applicants should write the program for additional information. Affirmative Action applicants are especially encouraged to apply.

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FUTURES INFORMATION INTERCHANGE

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INTRODUCTION

In this issue of the Futures Information Interchange, we are pleased to provide a collection of fourteen of the best articles from our past issues. While many of our subscribers will have seen some of them, it is unlikely that you will have read all of them. For those of you who are regular subscribers, we will provide a summer edition of the Futures Information Interchange this year which will summarize the major presentations at "Learning Tomorrows: The University of Massachusetts Conference on the Future of Education," April 18-21.

This collection is representative of the kind of article which we regularly publish in the FII. We have included pieces which are theoretical - e.g. Jock McClellan's "What is a Futurist?" - as well as those which are practical - e.g. Cyndy Guy's "Packaging Your Future Wheel." Most of our selections were written by members of the Future Studies Program, but some were not - e.g. Gary Snyder's "Four Changes," Some of the essay's are speuclative - e.g. Harvey Scribner's "To Enable is to Enoble" - and some are aimed strictly at useful futures' classroom techniques - e.g. Kahn and Dale's "The Boston to Provincetown Planning Game."

We hope you appreciate the collection and we look forward to bringing you the best of our "Learning Tomorrows" Conference this summer.

Peter Wagschal
Director
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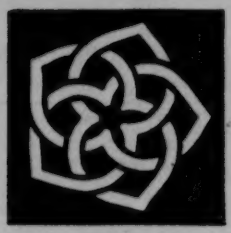
"WHAT IS A FUTURIST?"

Jock McClellan



We of the Future Studies Program at the University of Massachusetts have spent this fall wrestling with three questions. First, what is a futurist's defining role? Second, what skills are required to fill that role? Third, how can these skills be taught? The following section is a summary of our conclusions.

Our Definition of a "Futurist"

The initial question at first seemed trivial. We all knew what a futurist is, or so we thought until we tried to form a definition. We began by listing attributes we variously found desirable in a futurist such as "holistic", "analytical," "humanistic," " scientific," "optimistic," and "pessimistic." But such terms often contradicted one another, and could be used to define people in many non-futuristic disciplines.

An attempt to define futurists as a hybrid of existing disciplines such as sociology, systems theory, and statistics, failed. For though we agree that futurists draw upon the techniques of other disciplines, it seemed to us that they had an entirely separate role or purpose.

Thus, we developed the following definition:"A futurist is someone who makes possible futures more real for others." Where there is not yet an image for a part of the future, the futurist makes one. Where one already exists, he/she improves and clarifies it. He/she provides pictures of the possibilities from whcih we can pick, explores the "game-tree", sweeps the radar screen, sketches in the uncharted parts of the map. However we phrase it, the futurist's function remains the same, to "reify" the future possibilities for others - to make them "more real."

All who call themselves "futurists" fit our definition. Whether they be scientific forecasters or intuitive visionaries, systems analysts or social analysts, engineers or poets, they all serve to "make future possibilities more real for others."

In fact, by our definition everyone in the world is at least occasionally a "futurist," whether planning a family vacation or advising a child. Some, like the producers of Star Trek, may have more impact than many who call themselves "futurists." So we have defined a "professional futurist" as one whose primary endeavor is to make future possibilities more real for others.

This "reification" is a spiral process. First, futurists hypothesize present trends as future possibilities. With the materials of the present they construct futures, hypothetical realities. Once they have made these hypothetical realities more concrete, "more real", they can bring them back to the present for our present manipulation. They offer us symbols of what is not yet. Those symbols allow us to plan and assure us of continuity as we literally "make our way" from one present to the next.

This "reification" is an important social process. Sociologists of knowledge like Peter Berger and Thomas Kuhn have described the way our views of reality are largely socially constructed. Each person is raised to see the world through his/her culture's lenses, operates on that view where effective, slightly alters the view where ineffective, confirms the altered view with others, and raises his/her children with the view at hand. Mutual agreement to these views allows us to predict one another's behaviors, and to reduce the anxiety in choosing our own.

However, these mutually agreed upon views risk being narrow or based on untested premises. Changing circumstances may prove the views to be incomplete, and force painful adaptation.

The futurist helps prevent discontinuities by anticipating the changing circumstances and suggesting to society alternative ways it might adapt. Without such alternative images of what "reality" could be in the future, society would have no choice but to act on its present view of reality until that view proves deficient. Thus, by "making future possibilities more real for others," futurists provide materials necessary for societal evolution.

Thus, the ultimate role of futurists is to assure society the ability to renew its images of the future. Those images will be only as diverse as the variety of imagination called on and only as energizing as the extent to which they arise from and are accepted by society at large.

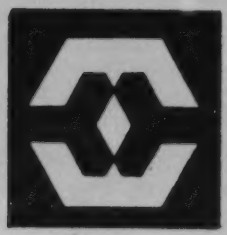
This highlights the important educational role for futurists. Not only must they develop in themselves the skills required to "make future possibilities more real for others, " they must also teach those skills to others, creating a "chain-letter" effect so that the ability to think futuristically spreads through society at large. This will increase society's ability to renew its images of the future and to choose among them in a responsive and adaptive way.

We hope our attempts to define a futurist will prove useful. We have felt that, by identifying our central role, we have been unburdened of the expectations of filling peripheral ones. No longer do we need to pretend to be experts in all disciplines, so long as we know how to tap those disciplines to fill our own role.

Our definition of the futurist's role contains three components. First, a futurist is concerned with "future possibilities." A measure of a futurist is the extent to which he expands and clarifies the multiplicity of possibilities. Second, it is "for others" that a futurist makes possibilities more real. He/she must communicate. Third, to "make more real" that unreal, abstract land called the future is the special task of the futurist. A futurist has succeeded when he/she has materialized a mental vision into a concrete comprehensive form which others experience as plausible, as a "real" Possibility.

THE "OPEN AND CLOSED" DIMENSION OF FUTURE TIME PERSPECTIVE

Jake Plante



Introduction

Intrinsic to any explanation of foresight capability or what makes a good futurist is a discussion of people's "open and closed" reference toward future-time. That is, the degree to which a person believes that luck, chance or a predetermined set of forces (closed) are responsible for the outcome of events versus how much she/he believes that events are affected by human effort and personal decision-making (open). A major premise behind Future Studies is the belief that while there are many natural laws and limitations to which we ultimately conform, there exists a great deal of human freedom to affect and select the course of personal and social events.

A closed outlook which is comprised of 1) inattention to the future (nil), 2) a non-causal, incidental view of events (random), and/or 3) a notion of predestiny and fate (fixed), is considered detrimental to an individual's social-psychological development and being a good futurist. On the other hand, an open outlook which is comprised of 1) thought and concern about tomorrow (active), 2) a view that many things are possible (plural), and 3) a belief that we have a "voice" in what happens (volitive), is considered conducive to the social-psychological development of an individual. Without these "open" attitudes many important human activities would cease and self-defeating passivism would block our commitments to self-growth, social responsibility, and community participation.

The Future-Cognition Questionnaire

The following 30-item questionnaire is designed to explore human personality in relation to the 6 aspects of the "open and closed variable" mentioned above. Directions: Hand out copies of the questionnaire to your students. Ask them to read each question and decide their personal preference; then circle the appropriate letter. Circle "A" if they agree or tend to agree with the statement, "D" if they disagree or tend to disagree with it. No time limit is necessary, however, respondent's need not linger over any particular question. You should be available to answer (privately) any question a student may have about a certain word or statement. As an additional measure, you might ask students to write a sentence or two on the back of the questionnaire describing how they felt about it.

Future-Cognition Questionnaire Name _____

A D 1. It doesn't help me a lot to think about the future.
A D 2. I believe that many alternatives exist for me and that almost anything is possible.
A D 3. I believe that what is going to happen will happen.
A D 4. Individuals make a considerable difference in the course of history.
A D 5. The future is completely unpredictable.
A D 6. Many things happen because they are fated or predetermined.
A D 7. I believe that planning is essential for making things come about.
A D 8. Luck has a lot to do with the outcome of events.
A D 9. Some people are born to be successful and others are born losers.
A D 10. I believe that, by and large, the future cannot change and that very little is possible.
A D 11. I live each day as it comes without concerning myself about tomorrow.
A D 12. The future is "open" and subject to move in any number of directions.
A D 13. Our misfortunes are the result of our mistakes.
A D 14. My future will be shaped by forces outside of my control.
A D 15. Most events occur by surprise with little cause or forewarning.
A D 16. Hereditary (family background, sex, race, height, etc.) and environmental factors will not, for the most part, determine what I become.
A D 17. The future is created, more so than not, by the choices that people make.
A D 18. I believe that many things (for example, meeting a certain person) are inevitable and will surely happen.
A D 19. I often think about what the future will be like.
A D 20. Most things which happen to me are because of chance.
A D 21. I believe that my horoscope can predict what will happen to me.
A D 22. It is possible for me to influence and change the direction of society.
A D 23. I do not believe that there is a destiny or inherent fortune to my life.
A D 24. Even though the future holds many unknowns and uncertainties about the future, my thoughts about it are a very important factor in my intended behavior.
A D 25. Every event imaginable could happen in the future.
A D 26. Most things which will happen to me, will be because of what I do, or do not do.
A D 27. I believe that my life is willed and guided by a special force or being.
A D 28. Contrary to common folklore, flipping a coin is not a good way to reach decisions.
A D 29. Planning does very little good because things will happen regardless.
A D 30. Choose (by circling its letter) one of the following 4 metaphors which most applies to your way of thinking:

a. The future is like the night; it eludes our vision and cannot be seen.
b. The future is like a tree; each branch is a choice of direction, each leaf a possible outcome.

c. The future is like a road; a chartered course we journey along.
d. The future is like a game of cards; chance determines the dynamics of play and outcome.

Scoring the questionnaire: Responses indicating an open outlook are: Agree: numbers 2, 4, 7, 12, 13, 16, 17, 19, 22, 23, 24, 26, 28, and "b" metaphor. Disagree: All remaining numbers.

Processing the Results

There are numerous ways to "process" a questionnaire of this sort. I suggest the following: After students have completed the questionnaire, initiate a general discussion centered around 1) the questionnaire itself, and 2) the 6 aspects of the open and closed dimension of future time perspective. (Other dimensions, for example, would be short-term vs. long-term and optimism vs. pessimism.) As circumstances permit, have the class conduct an item-by-item analysis in order to determine what each question was attempting to measure. As a particular question is discussed, ask for representative opinions for each response.

I strongly urge that, whenever possible, the "open and closed measure" be applied to other subjects of concern to your class. As part of this effort, you might incorporate into the above discussion broader kinds of questions (these will, of course, depend upon the nature of your class) such as: Could World War II have been avoided? (History) Who will be the next President of the United States? (Social Studies) Was Shakespeare meant to become a great author and playwright? (English) and How do meteorologists approach weather forecasting? (Science).

A RATIONALE FOR TEACHING THE FUTURE

Kathe Chatwood

"That's the reason they're called lessons,"
the Gryphon remarked; " because they lessen
from day to day."

-- Lewis Carroll

A traditional complaint of students in every age and era is that of worthless schoolwork, or irrelevant curriculum. Unfortunately, the majority of teachers would probably have to admit that much of what they currently teach will be forgotten or relegated to the realm of useless knowledge when considered in the practical aspect of application to students' everyday lives. Education today faces the momentous responsibility of preparing students for entrance into a society which is estimated to have undergone more political, technological, and economic changes in the last thirty years than have occurred in the preceeding two hundred.

Schools concerned with applicable-to-life learning need to shift from content to process orientation when designing curriculum which will prepare students for life in the 21st Century. The next one hundred years promises to be an age where the rate of change (i.e., its rapid acceleration) will affect each individual's life in extensive ways. Such innovations as solar and nuclear energy, automation, computerization and space travel seem to mark only the beginning of the post-industrial society.

Anticipated change is less threatening to people than unexpected change. Education with a futures orientation stresses the teaching of skills and topic matter that will be of use to students in meeting the challenges of predictably different tomorrows.

Teaching with a futures perspective does not supplant the traditional heritage of cognitive skill building which now characterizes school curricula, but rather enchances what schools teach by providing methods, materials, and awareness experiences relevant to the students' future lives. Preparing students for the future involves teaching them to be comfortable with the processes of anticipating and adapting to change, and to be aware of their individual capacities to make decisions which influence the direction of change in their personal lives. Learning involving analysis of and participation in the community is therefore a salient feature of futures education.

Future studies is different from other forms of educational theory in two respects: first, its broad view of the society makes it pertinent to all subject areas. Secondly, its intent is to increase the direct participation of education in influencing the guiding and shaping of society. Futures studies is thus not as much of a discipline as it is a process of perceiving future potential, problems, and alternatives as options for societal choice. Its techniques and curriculum foster a long-range and open-ended attitude in students, giving them personal practice in decision-making which they can apply to their own lives and the community of which they are a part.

Noted futures researcher and analyst, Willis W. Harman, feels that analysis of the current social atmosphere is "... vital to the consideration of education's future role. Not only does its fuller understanding give some clue as to the kind of future we may have to design education for, it also faces us squarely with the question of the kind of future education is to help bring about."

It is helpful for educators to be cognizant of the long-term trends which may occur in our culture. Some of these tendencies are listed in Mr. Harman's paper commissioned by the ERIC Clearinghouse on Educational Management:

SOCIAL LONG-TERM TRENDS

World-wide industrialization and modernization
Accumulation of vast amounts of scientific and technological knowledge
Increasing lag of technological solutions behind technology-created problems
Increasing affluence and increasing self-consciousness of the underclasses
Institutionalization of change in formal societal structures
Emergence of a knowledge society and a knowledge elite
Increasing interdependence of social and political institutions
Increase of growth-motivated persons
Unemployment of the unskilled
Increasing stress-producing forces on the individual

EDUCATIONAL LONG-TERM TRENDS

More people and money involved in education
New consciousness of education in accomplishing social goals and alleviating perceived social problems (i.e., poverty, racism, sexism)
Increasing involvement of education with other social institutions
Life-long learning and extension of educational period
Learning society recognizing life-experiences as educational episodes
Increasing departure from traditional methods of instruction
Competition-ethic reduced by individualized programs
Extension of power and control in education to teachers, students
Increasing blurring of distinctions between vocational and academic education
Non-authoritarian attitudes, shared learning and mutual respect between facilitators and learners

In the light of the projections made by Mr. Harman, it is obvious that if only half of the trends mentioned materialize, the world of both the future learners and their teachers will be quite different from today. Can teachers abbrogate their responsibilities for teaching students how to cope with such trends, especially if such instruction introduces awarenesses and skills to students which may help them anticipate and perhaps circumvent some of the more negative extrapolations projected for the society?

Such adaptive skills and topic matter are stressed in a futures-oriented curriculum and can easily be plugged into existing curriculum. Typical methods include normative forecasting, trending, cross-impact analysis, Delphi polling, and scenario creation, to name a few. These skills not only involve students directly in decision-making and problem-solving, but can easily be combined with relevant traditional skills such as data gathering and analytical reasoning.

Subject matter dealing with population growth, space travel and colonization, energy alternatives, genetic engineering, food production, and cloning are pertinent and interesting to students, offering endless possibilities in several disciplines for the creative teacher. For example, science fiction stories can be used to enhance literature programs. Such futuristic readings provide high interest motivation for students in working with traditional vocabulary, literary analysis and descriptive-narrative writing tasks. In addition, such materials assist students in exploring our current society's values and their possible future extension. Composition courses are much better received by students if grammar and writing principles are combined with such creative assignments as scenario writing. (Scenarios are stories which select details of current society and extend them into a future time frame, thus giving students skill practice in assessing the consequences of courses of action and decisions made in the present; Paul Ehrlich's "Eco-Catastrophe" is a well-known example.)

The entire realm of social studies should be broadened to include concepts in economics, political science, sociology, and psychology, besides that of history. In respect to the teaching of history, why not start with the future and work backwards in time, assessing how society followed certain trends to get where it is today? This process emphasizes directly that present and future consequences are the result of past decisions.

The final important area that future studies stresses in preparing students for the future is the aspect of human growth involving valuing, feeling, and aesthetic appreciation. The Sputnik-inspired emphasis on science and mathematics in the 1950's is now swinging back to an equal emphasis on the humanities and the sensiti-

vities to nature, self, and others. Emotional awareness and a sense of self-identity are as vitally important to students as the strictly cognitive materials formerly accentuated in schools. One may convincingly argue that they are more necessary for students' futures, for of what use are schools if they produce people comfortable and knowledgeable about concepts, yet unsure of themselves, unable to apply the skills and information they have acquired in their own lives and in their community by making adequate decisions and acting upon them? Practice at valuing and decision-making are imperative in the classroom. (Teaching Human Beings, by Jeffrey Schrank, is a curriculum-philosophy source that is replete with such sensitivity exercises. It would be an excellent addition to any teacher's or school's professional library.)

Futurizing classes is quite a stimulating undertaking for teachers of any grade level. It involves re-educating oneself, opening to an entirely new and sometimes exhilarating range of potentials within oneself as well as of the society at large. It will cause teachers as well as students to reassess their own values in the light of future potential developments by bringing to the surface issues and attitudes which are often overlooked in the rush to adequately teach the necessary basics. If a teacher is not open to the possibilities and hazards inherent in the future, can s/he really be effective in preparing students for a world where they will, after all, be living the majority of their adult lives?

Future studies education means an expansion in the school's traditional time frame. It encourages students and teachers to imagine alternatives, to think divergently and not be locked in by one way of relating to the world. It provides practice in generating creative solutions for problems, and develops clearer senses of one's own values and the ability to make decisions based on them.

FOUR CHANGES

Gary Synder

I. POPULATION

THE CONDITION

Position: Man is but a part of the fabric of life--dependent on the whole fabric for his very existence. As the most highly developed tool-using animal, he must recognize that the unknown evolutionary destinies of other life forms are to be respected, and act as gentle steward of the earth's community of being.

Situation: There are now too many human beings, and the problem is growing rapidly worse. It is potentially disastrous not only for the human race but for most other life forms.

Goal: The goal would be half of the present world population, or less.

ACTION

Social/Political: First, a massive effort to convince the governments and leaders of the world that the problem is severe. And that all talk about raising food-production--well intentioned as it is--simply puts off the only real solution: reduce population. Demand immediate participation by all countries in programs to legalize abortion, encourage vasectomy and sterilization (provided by free clinics)--free insertion of intrauterine loops--try to correct traditional cultural attitudes that tend to force women into childbearing--remove income tax deductions for more than two children above a specified income level, and scale it so that lower income families are forced to be careful too--or pay families to limit their number. Take a vigorous stand against the policy of the right-wing in the Catholic hierarchy and any other institutions that exercise an irresponsible social force in regard to this question; oppose and correct simple-minded boosterism that equates population growth with continuing prosperity. Work ceaselessly to have all political questions be seen in the light of this prime problem.

The Community: Exlpore other social structures and marriage forms, such as group marriage and polyandrous marriage, which provide family life but may produce less children. Share the pleasure of raising children widely, so that all need not directly reproduce to enter into this basic human experience. We must hope that no one woman would give birth to more than one child, during this period of crisis. Adopt children. Let reverence for life and reverence for the feminine mean also a reverence for other species, and future human lives, most of which are threatened.

Our Own Heads: "I am a child of all life, and all living beings are my brothers and sisters, my children and grandchildren. And there is a child within me waiting to be brought to birth, the baby of a new and wiser self." Love, lovemaking, a man and woman together, seen as the vehicle of mutual realization, where the creation of new selves and a new world of being is as important as reproducing our kind.

II. POLLUTION

THE CONDITION

Position: Pollution is of two types. One sort results from an excess of some fairly ordinary substance--smoke, or solid waste--which cannot be absorbed or transmuted rapidly enough to offset its introduction into the environment, thus causing changes the great cycle is not prepared for. (All organisms have wastes and by-products and these are indeed part of the total biosphere: energy is passed along the line and refracted in various ways, "the rainbow body." This is cycling, not pollution.) The other sort is powerful modern chemicals and poisons, products of recent technology, which the biosphere is totally unprepared for. Such is DDT and similar chlorinated hydrocarbons--nuclear testing fallout and nuclear waste--poison gas, germ and virus storage and leakage by the miliary; and chemicals which are put into food, whose long-range effects on human beings have not been properly tested.

Situation: The human race in the last century has allowed its production and scattering of wastes, by-products, and various chemicals to become excessive. Pollution is directly harming life on the planet: which is to say, ruining the environment for humanity itself. We are fouling our air and water, and living in noise and filth that no "animal" would tolerate, while advertising and politicians try to tell us "we've never had it so good." The dependence of the modern governments on this kind of untruth leads to shameful mind-pollution: mass media and most school education.

Goal: Clean air, clean clear-running rivers, the presence of Pelican and Osprey and Gray Whale in our lives; salmon and trout in our streams: unmuddied language and good dreams.

ACTION

Social/Political: Effective International legislation banning DDT and related poisons -- with no fooling around. The collusion of certain scientists with the pesticide industry and agri-business in trying to block this legislation must be brought out in the open. Strong penalties for water and air pollution by industries--"Pollution is somebody's profit." Phase out the internal combustion engine and fossil fuel use in general--more research into non-polluting energy sources; solar energy; the tides. No more kidding the public about atomic waste disposal: it's impossible to do it safely, and nuclear-power generated electricity cannot be seriously planned for as it stands now. Stop all germ and chemical warfare research and experimentation; work toward a hopefully safe disposal of the present staggering and stupid stockpiles of H-Bombs, cobalt gunk, germ and poison tanks and cans. Laws and sanctions against wasteful use of paper, etc. which adds to the solid waste of cities -- develop methods of recycling solid urban waste. Recycling should be the basic principle behind all waste-disposal thinking. Thus, all bottles should be re-usable; old cans should make more cans; old newspapers back into newsprint again. Stronger controls and research on chemicals in foods. A shift toward a more varied and sensitive type of agriculture (more small scale and subsistence farming) would eliminate much of the call for blanket use of pesticides.

The Community: DDT and such: don't use them. Air pollution: use less cars. Cars pollute the air, and one or two people riding lonely in a huge car is an insult to intelligence and the Earth. Share rides, legalize hitch-hiking, and build hitch-hiker waiting stations along the highways. Also -- a step toward the new world -- walk more; look for the best routes through beautiful countryside for long-distance walking trips: San Francisco to Los Angeles down the Coast Range, for example. Learn how to use your own manure as fertilizer if you're in the country -- as the far East has done for centuries. There's a way and it's safe. Solid waste: boycott bulky wasteful Sunday papers which use up trees. It's all just advertising anyway, which is artificially inducing more mindless consumption. Refuse paper bags at the store. Organize Park and Street clean-up festivals. Don't work in any way for or with an industry which pollutes, and don't be drafted into the military. Don't waste. (A monk and an old master were once walking in the mountains. They noticed a little hut upstream. The monk said, "A wise hermit must live there"-- the master said, "That's no wise hermit, you see that lettuce leaf floating down the stream, he's a Waster." Just then an old man came running down the hill with his beard flying and caught the floating lettuce leaf.) Carry your own jug to the winery and have it filled from the barrel.

Our Own Heads: Part of the trouble with talking about DDT is that the use of it is not just a practical device, it's almost an establishment religion. There is something in western culture that wants to totally wipe out creepy-crawlies, and feels repugnance for toadstools and snakes. This is fear of one's own deepest natural inner-self wilderness areas, and the answer is, relax. Relax around bugs, snakes, and your own hairy dreams. Again, farmers can and should share their crop with a certain percentage of buglife as "paying their dues" -- Thoreau says "How then can the harvest fail? Shall I not rejoice also at the abundance of the weeds whose seeds are the granary of the birds? It matters little comparatively whether the fields fill the farmer's barns. The true husbandman will cease from anxiety,

as the squirrels manifest no concern whether the woods will bear chestnuts this year or not, and finish his labor with every day, relinquish all claim to the produce of his fields, and sacrificing in his mind not only his first but his last fruits also." In the realm of thought, inner experience, consciousness, as in the outward realm of interconnection, there is a difference between balanced cycle, and the excess which cannot be handled. When the balance is right, the mind recycles from highest illuminations to the stillness of dreamless sleep; the alchemical "transmutation."

III. CONSUMPTION

THE CONDITION

Position: Everything that lives eats food, and is food in turn. This complicated animal, man, rests on a vast and delicate pyramid of energy-transformations. To grossly use more than you need to destroy, is biologically unsound. Most of the production and consumption of modern societies is not necessary or conducive to spiritual and cultural growth, let alone survival; and is behind much greed and envy, age-old causes of social and international discord.

Situation: Man's careless use of "resources" and his total dependence on certain substances such as fossil fuels, (which are being exhausted, slowly but certainly) are having harmful effects on all the other members of the life-network. The complexity of modern technology renders whole populations vulnerable to the deadly consequences of the loss of any one key resource. Instead of independence we have over-dependence on life-giving substances such as water, which we squander. Many species of animals and birds have become extinct in the service of fashion fads -- or fertilizer -- or industrial oil -- the soil is being used up; in fact mankind has become a locust-like blight on the planet that will leave a bare cupboard for its own children -- all the while in a kind of Addict's Dream of affluence comfort, eternal progress -- using the great achievements of science to produce software and swill.

Goal: Balance, harmony, humility, growth which is a mutual growth with Redwood and Quail (would you want your child to grow up without ever hearing a wild bird?) -- to be a good member of the great community of living creatures. True affluence is not needing anything.

ACTION

Social/Political: It must be demonstrated ceaselessly that a continually "growing economy" is no longer healthy, but a Cancer. And that the criminal waste which is allowed in the name of competition -- especially that ultimate in wasteful needless competition, hot wars and cold wars with "communism" (or "capitalism") -- must be halted totally with ferocious energy and decision. Economics must be seen as a small sub-branch of Ecology, and production/distribution/consumption handled by companies or unions with the same elegance and spareness one sees in nature. Soil banks; open space; phase out logging in most areas. "Lightweight done and honeycomb structures in line with the architectural principles of nature." "We shouldn't use wood for housing because trees are too important." Protection for all predators and varmints. "Support your right to arm bears." Damn the International Whaling Commission which is selling out the last of our precious, wise whales! Absolutely no further development of roads and concessions in National Parks and Wilderness Areas; build auto campgrounds in the least desirable areas. Plan consumer boycotts in response to dishonest and unnecessary products. Radical Co-ops. Politically, blast both "Communist" and "Capitalist" myths of progress, and all crude notions of conquering or controlling nature.

The Community: Sharing and creating. The inherent aptness of communal life -- where large tools are owned jointly and used efficiently. The power of renunciation: If enough Americans refused to buy a new car for one given year it would permanently alter the American economy. Recycling clothes and equipment. Support handicrafts -- gardening, home skills, midwifery, herbs -- all the things that can make us independent, beautiful and whole. Learn to break the habit of unnecessary possessions -- a monkey on everybody's back -- but avoid a self-abnegating anti-joyous self-righteousness. Simplicity is light, carefree, neat, and loving -- not a self-punishing ascetic trip. (The great Chinese poet Tu Fu said "The ideas of a poet should be noble and simple.") Don't shoot a deer if you don't know how to use all the meat and preserve that which you can't eat, to tan the hide and use the leather -- use it all, with gratitude, right down to the sinew and hooves. Simplicity and mindfulness in diet is a starting point for many people.

Our Own Ideas: It is hard to even begin to guage how much a complication of possessions, the notions of "my and mine" stand between us and a true, clear, liberated way of seeing the world. To live lightly on the earth, to be aware and alive, to be free of egotism, to be in contact with plants and animals, starts with simple concrete acts. The inner principle is the insight that we are interdependent energy-fields of great potential wisdom and compassion -- expressed in each person as a superb mind, a handsome and complex body, and the almost magical capacity of language. To these potentials and capacities, "owning things" can add nothing of authenticity. "Clad in the sky, with the earth for a pillow."

IV. TRANSFORMATION

THE CONDITION

Position: Everyone is the result of four forces--the conditions of this known-universe (matter energy forms and ceaseless change); the biology of his species; his individual genetic heritage; and the culture he's born into. Within this web of forces, there are certain spaces and loops which allow total freedom and illumination. The gradual exploration of some of these spaces is "evolution" and, for human cultures, what "history" could be. We have it within our deepest powers not only to change our "selves" but to change our culture. If a man is to remain on earth he must transform the five-millenia-long urbanizing civilization tradition into a new ecologically-sensitive harmony-oriented wild-minded scientific/spiritual culture. "Wildness is the state of complete awareness. That's why we need it."

Situation: Civilization, which has made us so successful a species, has overshot itself and now threatens us with its inertia. There is some evidence that civilized life isn't good for the human gene pool. To achieve the Changes we must change the very foundations of our society and our minds.

Goal: Nothing short of total transformation will do much good. What we envision is a planet on which the human population lives harmoniously and dynamically by employing a sophisticated and unobtrusive technology in a world environment which is "left natural." Specific points in this vision:

A healthy and spare population of all races, much less in number than today.

Cultural and individual pluralism, unified by a type of world tribal council. Division by natural and cultural boundaries rather than arbitrary political boundaries.

A technology of communication, education, and quiet transportation, land-use being sensitive to the properties of each region. Allowing, thus, the Bison to return to much of the high plains. Careful but intensive agriculture in the great alluvial valleys; deserts left wild for those who would trot in them. Computer technicians who run the plant part of the year and walk along with the Elk in their migrations during the rest.

A basic cultural outlook and social organization that inhibits power and property-seeking while encouraging exploration and challenge in things like music, meditation, mathematics, mountaineering, magic, and all other ways of authentic being-in-the-world. Women totally free and equal. A new kind of family -- responsible, but more festive and relaxed -- is implicit.

ACTION

Social/Political: It seems evident that there are throughout the world certain social and religious forces which have worked through history toward an ecologically and culturally enlightened state of affairs. Let these be encouraged; Gnostics, hip Marxists, Teilhard de Chardin Catholics, Druids, Taoists, Biologists, Witches, Yogins, Bhikkus, Quakers, Sufis, Tibetians, Zens, Shamans, Bushmen, American Indians, Polynesians, Anarchists, Alchemists . . . the list is long. All primitive cultures, all communal and ashram movements. Since it doesn't seem practical or even desirable to think that direct bloody force will achieve much, it would be best to consider this a continuing "revolution of consciousness" which will be won not by guns but by seizing the key images, myths, archetypes, eschatologies, and ectasies so that life won't seem worth living unless one's on the transforming energy's side. By taking over "science and technology" and releasing its real possibilities and powers in the service of this planet -- which, after all, produced us and it.

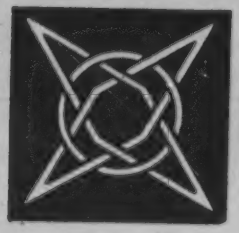
Our Community: New schools, new classes, walking in the woods and cleaning up the streets. Find psychological techniques for creating an awareness of "self" which includes the social and natural environment. "Consideration of what specific language forms--symbolic systems--and social institutions constitute obstacles to ecological awareness." Without falling into a facile interpretation of McLuhan, we can hope to use the media. Let no one be ignorant of the facts of biology and related disciplines; bring up our children as part of the wild-life. Some communities can establish themselves in backwater rural areas and flourish -- others maintain themselves in urban centers, and the two types work together -- a two-way flow of experience, people, money, and home-grown vegetables. Ultimately cities will exist only as joyous tribal gatherings and fairs, to dissolve after a few weeks. Investigating new life-styles is our work, as is the exploration of ways to explore our inner realms -- with the known dangers of crashing that go with such. We should work with political-minded people where it helps, hoping to enlarge their vision, and with people of all varieties of politics or thought at whatever point they become aware of environmental urgencies. Master the archaic and the primitive as models of basic nature-related cultures -- as well as the most imaginative extensions of science -- and build a community where these two vectors cross.

Our own heads: is where it starts. Knowing that we are the first human beings in history to have all of man's culture and previous experience available to our study, and being free enough of the weight of traditional cultures to seek out a larger identity. -- The first members of a civilized society since the early Neolithic to wish to look clearly into the eyes of the wild and see our self-hood, our family, there. We have these advantages to set off the obvious disadvantages of being as screwed up as we are -- which gives us a fair chance to penetrate into some of the riddles of ourselves and the universe, and to go beyond the idea of "man's survival" or "the survival of the biosphere" and to draw our strength from the realization that at the heart of things is some kind of serene and ecstatic process which is actually beyond qualities and certainly beyond birth-and-death. "No need to survive!" "In the fires that destroy the universe at the end of the kalpa, what survives?" -- "The iron tree blooms in the void!"

Knowing that nothing need be done, is where we begin to move from.

IMAGING

Duane Dale



We have defined the task of the futurist as "making images of the future more real for other people." One way to make future images more real for people is to involve them in making the images.

The tendency today is for futures invention to be the domain of an elite: analysts at the RAND Corporation or the Hudson Institute, planners at City Hall, executives of major corporations have already made decisions which will be affecting our lives in 1990. Most futurist educators are committed to the goal of democratizing the process of imaging alternative futures.

There are skills--teachable skills--which can enable the average citizen to become more competent at envisioning future alternatives. In fact, the citizen, unconstrained by bureaucratic vested interests, has the potential of becoming a better image-maker than the professional planners.

The task of the future-oriented teacher is really the same as the task of the director of a team of problem-solving consultants: to give instructions and create an environment which will lead to creative, effective invention of alternative futures. The instructions do not have to be complex. For example:

- Write ten headlines for the year you turn 30.
- Sketch the device which will take you to work at age 45.
- Write a short science-fiction story about life on a space station.

In these examples, the teacher has defined the problem and the medium for imaging; the methods for generating the "answers" are left up to the student's intuition. There are methods of creative problem-solving which make the steps in the creative process more refined and explicit. One rule of thumb goes like this:

- Study the situation thoroughly; become immersed in the facts of the situation.

- Manipulate the facts, figures, and ideas; make models; play with the problem.

. Leave it be; go away from the problem. Leave time for the creative process to work, for the spark of an idea to strike.

This is useful, but we can do better. Consider the starting points for new images of the future:

. A problem; a personal dissatisfaction, or someone else's.

. Analysis of the qualities of that which is; awareness of the possible dimensions of change. For instance, Buckminster Fuller observed early in his life that most buildings use the rectangle as their basic geometric unit. From musing how the triangle, with its inherent stability, might better used as the basis of architecture, he eventually invented the geodesic dome.

. Review of existing alternatives (e.g., How many games do you know that two people can play?); exploration of the possibility that new ones can be invented and added to the list. (Robert F. Kennedy was fond of quoting George Bernard Shaw: "Some people look at what is and wonder 'Why?' I prefer to think of what could be and ask, 'Why not?'")

From starting points such as these, a variety of classroom procedures can help students to utilize or develop their creative potential. The first of these is problem definition.

Q: What's the real problem here? (should be repeated many times to get to the essence of the situation which we want to image alternatives for.)

Q: Are there parts to the problem? Problems within the problem?

Q: What are the key words in the problem? Can you state the problem using only the key words?

The importance of this sort of thinking is best illustrated by an example. A team of engineers wanted to invent a better can-opener. As long as they tried to think of "a tool for making a hole in a can," they could only come up with minor variations on the familiar "church-key." Once they stated the problem, "How to get the contents out of a can?," they generated a large number of possible solutions, and eventually came up with the pop-top can. Perhaps if they had looked for "a way to get the contents out of a can, without leaving stray pieces of sharp metal," we would not have the pop-top tabs scattered over our countryside.

A good problem statement is really half-way to the solution; if you settle for the initial statement of the problem, you are unlikely to come up with any novel ideas. Once you (and your class) have explored alternative ways to look at a problem, you are ready to choose from a variety of "next steps."

. Brainstorming: Restate the problem. Set a time limit (5 or 10 minutes). Ask for as many solutions as possible; encourage tagging on to other people's ideas. No criticism of far-out ideas and no evaluation. Write the ideas large enough for all to see.

.Manipulate the present situation, using a list of verbs as a guide: magnify, minify, rearrage, alter, rotate, flatten, lighten, integrate, dissect, etc. Make up a list of words more appropriate to your problem; the ones here work best on physical design ("school building of the future"), but can also be used for abstract ideas ("election of the president").

.Name all the parts and qualities of the thing you're imaging alternatives for. List all the alternatives you can think of for each quality. Then start combining the attributes (like making faces with "Changeable Charlie" blocks) and see if any interesting ones emerge.

Once a variety of images have been discovered, it is then appropriate to return to techniques such as story-writing, sketching, and also model-building to develop these images. In the process of giving tangible shape to ideas, students may find that it's possible to combine the best of several ideas into one.

.What will it look like?

.What will it feel like to live in such a situation? (Not only for the student, but for people from other cultures or classes).

.What would it be like if the image becomes a reality AND
- . Martians land?
- . It's a rainy day?
- . Babies come from test tubes?
- . etc.

Textbook authors seem to assume that one can teach students how to understand their world, to analyze, to interpret, but not to create alternative visions. Yet, it is possbile to develop creativity. The process of invention is not only at the heart of future studies; it is what's being demanded by the many who call for "relevant education." Problem-solving and creativity are the essence of relevance.

We especially need to help our students develop their imaginations about social arrangements. It is cliched but still true that our success in inventing technological hardware has outpaced our ability to imagine new social arrangements which cope with the problems our technology creates. We need social inventions which provide solutions to unemployment caused by automation, education, which is outdated before it is even used, and other social problems.

The task is not easy; most teacher education programs do not deal with creativity. The following books may help:

.The Universal Traveler by Don Kober and Jim Bagnall. Wm. Kauffman, 1974. Ppbk. $3.95. Very good at presenting specific techniques for analysis; problem definition; idea-generation development, and selection; implementing, evaluating, and communicating.

.The Creative Behavior Guidebook and Workbook, by Sidney Parnes. Many exercises suitable for the classroom.

PERSONAL LIFE PLANNING: EXPANDING THE REALM OF THE POSSIBLE

Duane Dale

Introduction

A major goal of future studies education is to enhance the ability of learners to envision new possibilities, decide which are attractive, and implement them. Another way to put this is that we would like to help the learners to become better planners -- planners who are capable of taking the future into account.

This newsletter has, in its brief history, presented a variety of techniques which would enhance student's capacities to think about societal futures -- to do social planning. ("Social planning is too important to leave to the planners"....so runs the argument.) But there is a lesson to be learned from some of the master reading teachers, such as Sylvia Ashton-Warner or Paolo Freire, who have found that when vocabulary words are ones which mean something special in the personal lives of the learners, learning is more rapid. The parallel for futures educators is this: We are liable to increase motivation and improve our effectiveness if we introduce futures methods in connection with content which is most important to the learners: personal futures.

This article presents several exercises which together could provide the core of a unit on personal life planning.

Assessment. Everyone is a planner already. The purpose of this first exercise is to give the students an opportunity to think about how they go about planning.

> Writing assignment: Plan a vacation that you would like to take. Where would you go? Who would go with you? What would you bring? How would you get there? What would you do once you got there? How long would you stay? What sort of planning and preparation will you have to do before you leave? What information will you need?

Share papers in groups of three, so that everyone reads two other papers. Then allow each person five minutes to say why s/he chose the vacation s/he did, and how s/he figured out what planning and preparation would be necessary. The two listeners can ask a few questions, like newspaper reporters might, but not too many. They will have their own turn to talk. The teacher keeps time, and follows up with discussion of different goals or values for vacations, and different means of planning.

Futures perspective. Alvin Toffler, in Learning for Tomorrow (New York: Vintage, 1974, $2.95. pg. 6 ff.), presents an exercise which often confronts the participants with their tendency not to consider likely social futures when they do personal life planning. He asked students to

....help formulate a collective image of the future by writing down on a slip of paper seven events he or she thought likely to occur in the future, and to date these events. (Toffler) avoided saying anything that would restrict the kind of events or their distance into the future.

The results were listed in chronological sequence, with their dates, for all to see. Toffler probed for the assumptions and methods which led to the forecasts. One tendency Toffler observed with several classes was to exclude oneself from the picture -- to give impersonal events. So he asked for a second list of events:

> List seven events that will happen to you personally, and give dates for each.

At this point, the students can be asked to compare their two lists, putting all fourteen events in chronological sequence. For each social or impersonal event, ask them to state whether it would affect any of the seven personal futures, and if so, how.

Life Planning. This is the key exercise of the sequence. It can be performed as a writing exercise or a class discussion. Some parts of it can be usefully expanded with sketching, writing of poems, word collages, or other creative approaches. The basic approach can be modified for a wide range of ages.

Goals:	List five things you hope to do or accomplish in your lifetime.
Priorities:	Put a number from one to five beside each, to indicate which is most important, second, etc.
Preparation:	For each event, list what you would need to know, be able to do, or any other preparation necessary.
Help:	What sort of people could help you achieve your goals?
Time:	Give a date for each event, by which you would hope to achieve or complete that activity.
Problems:	List one possible future event for each of the five goals which would make it difficult to achieve the goal.
Alternatives:	For each goal, list two alternatives that would be interesting or attractive to you if you couldn't achieve the original goal.
First steps:	For each original goal, list one thing that you could do within the next year that would be a step toward the goal. Could you take any of these steps within the next week?

Impacts. Within a student's lifetime, it is quite possible that

a) Petroleum-based fuels will become extremely costly and may, in fact, be virtually exhausted. We will shift to other forms of energy.
b) Space colonies with 10,000 inhabitants will orbit the earth.
c) Widespread famines will force world leaders to deal with the problem of overpopulation by placing legal limits on family size.
d) Other: _____(invent additional possibilities or use ones from the Toffler exercise.)

Have each student pick one of the five goals from the previous exercise and consider the impact on it of the three possibilities above.

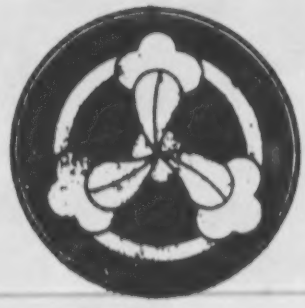
Goal: _____

_____

FUTURE POSSIBILITY	Assume the possibility occurs. How will it affect your ability to achieve your goal?	What could you do to make it more likely for you to achieve your goal anyway?
a) End of petroleum fuels		
b) Space colonies		
c) Limit on number of children		
d) Other: ___		

These four exercises can provide a stepping-off point for a wide variety of other activities. Scenario writing ("future autobiographies") are one possibility. Another is to reason backward from a future date at which a goal is achieved, so that one develops a list of events with years which lead from the goal back to the present. Values clarification exercises provide a guide to the specification of goals. (See, for example, Values Clarification by Simon, Howe, and Kirschenbaum.) Each teacher will probably want to design additional activities which pursue the student interests stimulated by the four exercises.

If we are going to become better planners -- planners who take the future into account -- it behooves us all to begin with the planning activities over which we have direct control: the planning of our own personal futures.



TO ENABLE IS TO ENOBLE

Harvey B. Scribner

Our society is fraught with an ailment which permeates both the thinking and actions of those in power. Whether it be Foreign Policy or Domestic Issues--the "ins" of our society tend to cling to the mindless notion of "We'll do it for you' as contrasted with the idea of "enabling others to do for themselves." The short term action of temporary alleviation of the crisis appears to have a higher priority in our planning strategies than long range efforts to try to eliminate the cause. Quite obviously, treating the symptoms of non-achievement, non-conformity, hunger and other people-type disasters with "more teaching," "more discipline" and "more hand outs" via larger bureaucracies and added funding is simpler and more politic, demands less creativity and less political risks than identifying and dealing with the real causes.

The point of this paper is--isn't it time for us to bite the proverbial bullet and place the welfare of people above personal politics? Isn't there someone in the decision-making role who is ready, willing and able to risk the decision of enabling the victims to do for themselves? The point is--isn't there someone in power who will use the same level of funding currently expended for those who are under-achieving, those who are damning the services by others, those who are suffering from hunger and other maladies to work realistically on their own problems? This would be in sharp contrast with the current common practice of the "ins" benefitting from the troubles of the "outs."

Neal Postman, Professor at New York University, in 1970 published an article called "A Fable." It was first carried as "A Fable" in the New York Times in 1970, and when New York City hit the skids in 1975, the same article reappeared as "A Fable Whose Time Has Come." In essence Postman was saying that, "the students in the public schools heretofore had been part of the general problem (of the city) whereas, with some slight imagination and a change of perspective, they might easily become part of the general solution." What Postman was saying about the youth and the problems of New York City could be equally enlightening to any other community in this country. The youth are there, the need is apparent, the resources are abundant--the missing link appears to be "some slight imagination and a change of perspective."

Indeed, we sit on the brink of potential solutions to the plaguing problems of the "inner city." Yes, the solution promoted here will be fraught with a myriad of problems. The key decision to be weighed is--will the crises created through a program of "self-help" be greater than the current ills of graft, non-accountability, crime, an increasing sense of hopelessness and the creation of more millions of "have nots" in our society? Have we had enough of a governance system which accelerates the power and benefits to the "ins" in our country and contributes daily to the loss of dignity, self-responsibility and degradation of the "outs?" Lastly, and yet more critical, how long can we survive as a society on our present path ..... which divides our country into the two camps of "those who have" and "those who have not?" Or, "those who hope" and those who are "hopeless?"

The recommended reform presented here is too simple to pass off lightly. It requires no additional dollars. It hits directly at the issues of economics for those in need. It moves from the current welfare-type prescriptive programs which

are miserable failures for the depressed. It gets directly to the causes. Funds currently spent for policing, collecting garbage, maintaining fire safety, providing health services and schooling the inner city or any designated section of the inner city would merely be expended at the current rate. Creativity and courage on the part of the current decision-makers is needed to implement the following steps:

1. Calculate the per capita expenditures currently planned for the targeted area for all services and make those funds available for this new approach.

2. Enable the residents of the targeted section of the inner city to elect in accordance with currently established State and local voting procedures a governing commission. Only persons holding legal residence in the area are eligible to either vote or to serve on the governing board.

3. The elected governing board would have available for the services of policing, fire protection, sanitation, health services and education a level of funding equal to the monies currently spent in the targeted area.

4. All persons serving the targeted area whose jobs would come under the responsibilities of the newly organized governance board should be granted the following option: if roles similar to existing roles are utilized by the newly organized governance board, all jobs, which are re-activitated should be maintained by present holders providing they live or (within a specified period of time) become a full resident of the targeted area.

5. Laws and regulations promulgated by Federal and State Legislature and their agencies, and only those laws and regulations, should apply to the governing board of the targeted area.

Clearly, the recommended reform is simple. It becomes complex only when one delves into the age-old custom of (a) placing personal gain above gain for others, (b) making subjective judgment about the inabilities of others to make decisions for themselves, and (c) lacking the vision to project the risks involved in the continuation of a social practice which demeans, defeats and dehumanizes millions of people who have neither hope nor courage to resolve their problems.

The reform, simple as it is to implement, opens many new avenues of hope. Inner city people will govern themselves. Accountability will not be left to the "downtowners"--it will flow from voter to elected local folk and back to voter. Though the system may have failures, the faults would lie within the voter--not because others failed the voter.

Education for the youth and the parents of the target area would come alive. The process of solving their own problems of policing, cleaning, and educating the youth would become an education in itself. Both the young and the old--everyone--for the first time in this century would have a stake in their own neighborhood. Education which until the reform had been relegated to the four walls of the school building would now be seen in a new context. Time would be allotted and serious concern given to the basic skills. Those skills would, however, be tied to the new way of living--saving the neighborhood. In addition, the youth and the school would

be realistically involved in the process of enhancing the quality of life. Caring for the young, concern for the elderly, publishing a neighborhood letter, plantings, art work, neighborhood services would become a part of living/learning in the rehabilitated neighborhood.

As Neal Postman clearly indicated in his article, "A Fable Whose Time Has Come" the youth of the area "will find their education in the process of saving their city." Postman correctly argued that "the students in the public schools had heretofore been part of the general problem whereas, with some slight imagination and change of perspective, they might easily become part of the general solution."

Why not give it a try? The only obstacles to reaching for a highly potential solution to a serious problem have been placed there by people. Are there not people seriously enough concerned to remove them and get going on a program of hope? All of the rhetoric concerning educational reform is pure fantasy until we tackle the problems of their root. Unemployment, inadequate pay, housing conditions, malnutrition are part and parcel of education. The need has never been greater for attempting an economic program which could benefit the victim, society in general, and provide a workable base for educational reform.

CURRICULUM DEVELOPMENT IN FUTURE STUDIES

Cyndy Guy

Many schools seem to be entering an era of increased accountability and what appears to be a return to more basic skills-orientated curricula. It is not always easy to introduce areas such as "the future" (which many schools envision as too abstract and amorphous) into this academic climate.

This article shows how a teacher can develop future-oriented curricula while at the same time following an orderly, easy to understand procedure. In order to show this process I have followed the traditional steps developed by the grandfather of curriculum and instruction, Ralph Tyler. My intent is not to go into detail about the various steps but to show that such a process can be used as a guide by future-oriented teachers, especially when faced with questions dealing with the relevance of teaching about the future. I would recommend that readers consult Tyler's book, Basic Principles of Curriculum and Instruction, if they wish a further explanation of his curriculum process.

In the example that follows, hypothethical and randomly selected data has been created relating to students in an elementary school. Data could be gathered from a variety of sources; the community, the school, individual teachers, etc. A fifth grade teacher has used it in order to generate future-oriented curricula ending with the specific learning opportunities to be used with the students. The chart that follows represents a small segment of curricula and the suggestions in each column are examples and not to be thought of as complete. The reader should also be reminded that the curriculum developer, here the teacher, must be concerned with various aspects of the curriculum organization. Is there continuity, sequence and integration of the curricula with the other learning going on in the classroom and school?

The chart should be read in order, I-VII.

VII - INSTITUTIONAL LEARNING OPPORTUNITY	VIII - INSTRUCTIONAL LEARNING OPPORTUNITY
A. Students participate in two seminars per week dealing with 'The Future' simultaneously while taking environmental studies.	1. Working in small groups list as many issues as possible that you see as future concerns. 2. On individual lists rate these as affecting you personally, #1 being that which you think could affect you the most, etc. 3. Underline the issues from your list that you think you could have a real part in altering the course.
B. Students attend seminar once a week during social studies period called 'Self Discovery.'	1. List at least ten activities you have done in or out of school in the past year that you have enjoyed. 2. Underline the items from #1 that you think you would enjoy doing more of in the future. 3. Circle the items which you think you would be good at sharing with others. 4. Check the items you could show someone during the term and put an X next to the ones you don't wish to share. 5. List the items you think you would put on a list in five years.
C. Students spend one elective period per week in planning for class tentatively called 'Leisure time and the Environment,' to take place next term.	1. In groups of four, using the blank cards, list all the activities you enjoy doing during your 'free time.' 2. Place a check on all the cards which your group feels are not overly harmful to the environment. 3. Each person select a card of interest from the group in #3. 4. Write a one-page scenario about you doing this activity at some date in the future which your group has agreed upon.

An extremely important part of the curriculum process is evaluation. This can take place at different times during or after implementation of the curriculum. The feedback from evaluation enables students and teachers, working together, to improve the curriculum as well as to help discover specific areas that are weak. An example of the evaluation that could be used with one of the instructional objectives follows.

Evaluation process for instructional objective, 'to expand images of the future.'

a. Specification of behavior and content of objective:
'expand' - increase; add to
'images' - likeliness; appearances; sight
'future' - time to come; hereafter

b. Setting:
Students are given a list of favorable societal futures taken from an earlier brainstorming session. Each student selects one future and is asked to list as many possible ways they can imagine where they might input in the future so that it might come to pass.

c. Recording:
Teacher checks items for plausibility, imaginativeness and numbers.

d. Scoring:
Teacher adds items considering criteria in 'c.'

e. Summary of data:
1 - 5 = poor imagery
6 - 10 = average
11 - over = well developed sense of imagery.

f. Sharing of findings:
Papers are returned with comments; the information from summary is kept for the teacher's records. A plus is indicated on the papers where there has been an increase of items over a pretest of the same nature given earlier in the unit. A discussion follows concerning the return of papers. Individual conferences are held with the teacher if student or teacher requests one.

g. Recycling and alterations:
On the basis of the returned papers and discussion, issues might have been brought up concerning test reliability since several criteria were looked for. Perhaps further subdivision are needed so that it will be easier to determine more precisely where student and curriculum weaknesses are.

There are many ways to develop curricula; I have included but one form. The Tyler model is a very linear, deductive process which was included here because it is easily adaptable and flexible and offers a good foundation for any number of curriculum tasks. This might include anything from interpreting data to the sharing of lesson plans with a questioning parent. This is especially important for curricular areas that are relatively new, such as future studies, and also for those that were not intended to be neatly packaged into the existing slots used to describe the program of studies at most schools.

BOSTON TO PROVINCETOWN PLANNING GAME

Robert Kahn and Duane Dale

Introduction

Your group is a "high-powered" transportation planning team recently contracted by the Commonwealth of Massachusetts to solve a serious transportation dilemma. The plan developed by your staff will most probably be implemented, since construction monies have already been allocated by state and federal agencies.

The process outlined here is presented as a guide to assist you in designing your transportation plan. As a guide it is not "iron-clad", and may be adjusted to suit your planning team's needs. It has, however, been carefully developed, and will probably help you greatly in solving the Commonwealth's transportation dilemma.

The Problem

"Each year, more and more people are travelling from the metropolitan Boston area (metroBoston) to Provincetown and the north end of Cape Cod during the summer months. The Cape's holiday season has extended from early May well into September, and at the busiest times roadways leading onto the Cape and on to Provincetown are jam-packed with vacationers. Since the vast majority of travelers most journey by automobile, the traffic jams are often monstrous. A trip from Boston to Provincetown can take as long as six hours, over twice as long as it would take in the off-season. Accompanying tie-ups of people's time result, along with increased environmental deterioration.

"The Commonwealth of Massachusetts has decided that some action must be taken to alleviate the severe traffic congestion, since if something is not done soon, it is believed, people will stop coming to the Cape altogether and severely rupture the region's economy. A plan must be developed to meet the seasonal need for improved transportation facilities.

"The 'design-hour,' or numbers of persons travelling between Provincetown and Boston at any given peak hour, is 2000 persons leaving Provincetown with metroBoston as their destination, and another 2000 leaving the Boston area with Provincetown as their destination. Any transportation plan must meet this demand at any given hour of the day between May 1 and October 1 at the very least.

"In devising the 'best' way of getting these persons to their respective destinations, the plan must employ only those technologies which are currently available or feasible."

Transportation Planning Guide

STEP ONE:

Locate a map of metroBoston, Provincetown, Cape Cod and Cape Cod Bay. This map of the Cape Cod Bay Region should be prominently displayed in the room your planning team will be using.

STEP TWO:

Find a comfortable place to sit or recline in the room your planning team will be using. In order to solve this vexing transportation problem it is important for your planning team to feel it as much as possible.

(Have one member of your team slowly and carefully read what follows to the others.)

"Close your eyes. Not too tightly, gently. Relax and let your mind go. Let your imagination go. Go. Go to..."

"You're sitting behind the wheel of an over-heating car at the foot of the Cape Cod Canal. You're trying to leave the Cape after a lovely summer weekend visit. Trying. You're sitting within eyeshot of the Cape Cod Canal as you have been for what seems like hours. Your car has averaged approximately 2 miles per hour for at least 45 minutes."

"Your sunburn is killing you. People have begun to honk their horns and you know no reason why they would want or need to. The fumes of the cars ahead of you is getting into your sinuses. You can't turn on the air conditioning because then the car will certainly overheat."

"It is a mess." You ask yourself: 'Is even Cape Cod worth this?'

"Relax again. Slowly when you feel you are ready, slowly open your eyes and return to the room..."

As a planning team take several minutes to share your feelings with one another as to how you felt in the situation which just occured in your imagination. What were you thinking? How were you feeling? Did you think that the Cape was worth all that? How did you feel about the other people in their cars? How did you feel about the people going the opposite direction at 60 mph?

After discussing everyone's feelings in the group (among those who want to share their feelings), each person should separate themselves off from the group for no more than 15 minutes and compose a poem, execute a drawing or write in a prose form their feelings in the car. Describe these feelings any way you feel since these papers are to be kept private, and filed away. Do remember where you have put them though; you may want them later.

STEP THREE:

The planning team should now reconvene once again, this time for a brainstorming session. In a brainstorm a definite period of time is reserved wnen all judgments are suspended. The ideas generated in a brainstorm should be recorded faithfully where all can see them; these ideas belong to the group as a whole, and not to one person. In a brainstorm, quality is not sought as much as quantity is; everyone seeks to produce as much as they can once the brainstorm has begun.

The topic of this brainstorm is to: think of all the different ways a human being could travel from Boston to Provincetown.

During the 5 minutes for this brainstorm a recorder should copy all the different methods the group decides that people can get between these two places. The list should be posted at the front of the room where everyone can see it. Remember nothing is too outlandish to include. If you think of it say it; don't judge an idea, especially your own!

STEP FOUR:

Another brainstorm should now be conducted. During this 5 minute period, name as many different animals and how they would get themselves between Boston and Provincetown (assuming they wanted too). Think of both verbs and the names of animals (excluding humans), not necessarily together. Get as many items onto the brainstorm list as possible.

When the 5 minutes are up, the group should then draw connecting lines between the names of the animals and the means they use to get about. If you encounter a name of an animal without a corresponding means of transport, fill that in at this time, but do not continue the brainstorm.

STEP FIVE:

Having completed the second brainstorm, return with it to the list which resulted from the first. Is there anything on the animal list which reminds you of a human form of transport which your team somehow left off of the human list? If so include that form of transportation at this time.

STEP SIX:

Any planning process requires that the planners observe certain "design criteria", established by their clients, which in this case is the public and the state government. Design criteria are boundaries which any planning team needs to observe. For example, the transportation plan you design should only cost as much as the taxpayers are willing to pay for it.

Of course, some criteria are bound to be considered more vital than others. Take for instance, the teams which design super-highways, their primary design criteria is to make it possible for people to drive cars as fast as possible on these highways. They are concerned, but less so, that the highways are attractive in how they "blend into" the landscape, or even what the costs in energy terms (amount of coal, oil, electricity needed to construct or maintain it) are of the highway. "Trade-offs", or arrangements of design criteria to reflect the priorities of the people planning and building them are inevitable.

Your planning team will want to be acquainted with the design criteria related to the Cape Cod Bay Region project, and establish their relative importance by rank ordering them. What follows then is the list of design criteria (in alphabetical order) the Commonwealth wants your team to observe:

aesthetics
comfort
economic
energy efficient
flexible
safe
social effects (positive)
speed

Your planning team may add any additional design criteria you see fit, but none from the list above may be ignored.

STEP SEVEN:

It is important that your planning team reach consensus (working agreement) on the meaning and rank order of each of the design criteria. For that to occur, your team must first clarify to each other and to yourselves indepently what you mean by each of the criteria listed above.

(a)
Begin with a fill-in the blank exercise. Each group member should work separately on this. Chose the first design criteria from the list above and the name of an animal from the animal brainstorm list (of your choosing). Then fill in the blank for the sentence:

Aesthetics is to a human as ____?____
is to (fill in name of an animal).

Take no more than 30 seconds to fill in the blank for each sentence and don't linger in choosing the name of an animal for each sentence. No more than 5 minutes should be allocated to this entire step.

(b)
Now still working independently, each member of the team should try to define in his/her own way what they mean by each of the design criteria. They should prepare a method of sharing their definition with other members of the group in any way that is comfortable for them, so long as when the group reconvenes no additional explanation will be necessary for group members to understand an individual's definition. The sharing of the individual's definition will be done in silence. Therefore be careful to describe your definitions of the design criteria so that they will be understood by the others. Take at least 30 minutes to develop these definitions (more if time allows and seems necessary).

(c)
Reconvene as a group and exchange the definitions so that each person has had time to read everyone else's.

(d)
With this done, break the silence and begin to discuss the definitions as a group. Try to find a way to come to a group definition of each design criteria that everyone in the group can accept. This may take time, but let it. Discuss each criteria in turn until the person(s) arguing for a definition the group majority does not accept is satisfied that s/he will be unable to change their minds, and is willing to go along with the majority.

(e)
When the group has reached agreement on the meaning of the terms, use the same consensus process to rank order the design criteria. Again it is vitally important to reach consensus and don't become frstrated if this takes a lot of time. Be sure to post your agreed-upon definitions and their ranking in a place where everyone can see them.

STEP EIGHT:

Now give everyone on your team an opportunity to make suggestions on now a plan might work to meet your problem and be consistent with your ranking of design criteria. Listen carefully to each proposal in a modified brainstorm format; hold all criticisms of the proposals until everyone has offered their suggestions. When the presentations are finished then go ahead an discuss the advantages and/or disadvantages of the respective proposals. After as much discussion as you feel you need, choose a proposal or a composite of proposals to build your team's plan around.

STEP NINE:

At this stage, the actual design of your transportation plan can begin. Be sure to involve everyone in the process; each person will have something different and useful to contribute. Be sure to keep your maps of the Cape Cod Bay Region and your list of ranked design criteria in a spot where everyone can see them.

You will vant your plan to remain true to the ordering you have chosen of the criteria and to have the plan answer questions such as: What will be the cost of construction (economic)? What form of energy will be used to power the transportation system (energy efficient)? Each of these questions, along with many many more will be needed to be answered by your plan.

Do not be concerned if you do not have all the necessary information you might need to complete the plan readily available. Feel free to "guesstimate" data where it is necessary. Only be sure that your transportation plan is internally consistent and that each part fits in nearly with all the others.

Draw a lot of sketches all along the way in your preparation of the plan. These can be very useful in clarifying the plan not only to your planning team itself but to the general public when the time comes to present it to them.

The designing process may go on for many hours or even days. Develop to your group's satisfaction or as much as your time allows.

STEP TEN:

When your group feels that your plan is ready, reserve a time and place to present it to a group of persons who are unacquainted with what your team has been doing.

The opportunity to present the plan should be seen by your group as a chance to see whether what you have come up with is going to be well received by the public.

Sometime before your presentation, go back and get your statements of what it felt like to be stuck on the highway trying to leave the Cape after a summer holiday. Afterall, your feelings at that time are exactly what your plan is supposed to eliminate (probably). Honestly now, does it? If you and your team can answer with an enthusiastic yes, then prepare your presentation.

Preparing your presentation should be done with care. Remember that your audience is unaware of what you have been doing all this time. You will have to be very clear about your plan, the problem as it was given to you and the process you employed to arrive at your plan.

Take nothing for granted, the audience may not want to know everything, but it will want to know the most important aspects of your work.

When you make your presentation, allow plenty of opportunity to gather reactions from your audience. Their comments can greatly help you to improve your plan, or perhaps reject it altogether. Very often someone who has not participated in developing a plan as your team has, may be able to see through it to an obvious flaw which you, as involved as you have been in developing it, may have overlooked.

FUTUROWORLD

Edward Rappe

One of the tasks for Future Studies courses is to improve the ability of the students to communicate. Communication in the future will assuredly be different than it is today. One way to develop students present and future communication processes is through the activity called "Futuroword."

The cultural exchange we have with the future is much the same as the cultural exchange we have with foreign cultures. The initial problem of cultural contact is that of communication. A new language must be learned as an aspect of a new culture. The interpreters/translaters of the future are people who master a number of language and concept combinations in order to survive. The same role is used with individuals who move into the future. They must learn to transform the language of today as a result of the influx of a myriad of new ideas to develop. One "future language" is that it generally comes into being much more slowly than an entirely new language in a new culture.

"Futuroword" is an attempt to introduce high school students to the concept of word formation, construction, and usage in the present as useful guides for future language communication. The explanation of prefix, suffix, and root word is not completely understood by all students; it would be of use to re-teach these concepts to students to assist them in understanding the new combinations the future will present.

The intent of "futuroword" is to improve the students' skills with language and prepare them for adjusting to the future with a minimum of trauma. The mass of evolving new words and their arrangements is overwhelming to the layperson. (Layperson is such an example of culture change.) A study of word evolution demystifies the labelling of change in our culture.

The "game of futuroword" assists students in the future in the present. First, students are to translate a "futuroword," assigning it a meaning. There are any number of allowable meanings. (Encouraging teacher flexibility.) The second step encourages the students to use what they have learned by developing a vocabulary of prefixes, suffixes, and root words, and designating them as "futurowords." Resultingly, a three-fold effect. The students learn to use their language more carefully in the present, to conjecture on words providing images of possible futures, and to discover or create new ideas or future events by combining old parts of words.

Word-Sheet

Instructions: Briefly state a possible definition to each of the following New Words.

1. Ecotactics -
2. Technostructure -
3. Tempostructure -
4. Telemeter -
5. Chemot eraphy -
6. Environmeter -
7. Moonling -
8. Poppulution -
9. Minibus -
10. A MooBus -
11. Controlife -
12. Edujection -
13. Refusevac -
14. Thermalwalks -
15. Monobureaucracy -

Instructions: Create a new word to describe each of the following ideas listed below. (Cannot be an existing word)

1. A train which travels under the ocean's floor.
2. A new type of mechanical heart.
3. A large, more efficient human brain.
4. Immortality of the human body through freezing.
5. Any type of future sport.
6. A catalogue for body parts.
7. A new concept of using the sun's energy.
8. Custom ordered body parts.
9. A boot used to walk on the ocean floor.
10. A new method of controlling the weather.

In order for a "futuroword" exercise to work, the teacher should have certain "tools" on hand. The first and foremost with any class is the mental attitude or mind of openness set. The class must be prepared to do something comparable to a "Scrabble" game of words. They must understand the possibility of uselessness in creativity; they must understand the joy of foolishness and spontaneity in creativity.

Other tools are dictionaries and encyclopedias; those with Greek and Latin rootwords assist word dissection and lead to more creative options for word combination. The reference shelf of the school library is also of use. Another source for "futurowords" is "The American Heritage Dictionary of the English Language." The appendix in the back on Indo-European Roots adds a helpful dimension on word construction and demolition. With these research aids, students can make word constructions for a number of root words. The only thing to avoid now is the students' attempts to manufacture an advertisement term without resoting to the word constructed of prefixes and suffixes.

In order to provide some practice try to translate the following few terms. Remember--there is no one correct answer.

What do these words mean:

Edujection
Environmeter
Tempstructure
Chemotherapy

What is the futuroword for each of these definitions:

A catalogue of body parts
A mechanical heart
A machine that stimulates the mind
A chemical to control weather

There are, of course, many more. Try them on your students. The exercise sheet which follows gives you more potential "futurowords" with which to creatively explore language and culture change.

PACKAGING YOUR FUTURES WHEEL

Cyndy Guy

Your Futures Wheel is really a picture or graphic way of showing what other things might happen if your trend, in the center, continues. We will be using this information in many ways and therefore it will be necessary to explain it to others in simple or summarized form. In order to "package" or make smaller all the information from your charts, complete the following steps.

1. Complete the circle.

2. Recheck each subtrend from the one before it. Do you think the information is fairly realistic? It helps to use arrows in continuing your circles out.

3. On the back of your chart summarize what you think are the main results of your wheels. What things do you see frequently recurring as you do your wheel? It often helps to use different colors as you do your wheel repeating like subtrends with the same color. Instead of writing you may wish to draw a small chart to show the results.

4. Do this neatly. You will be handing your wheel and summary to other members of your group to study.

Comments:

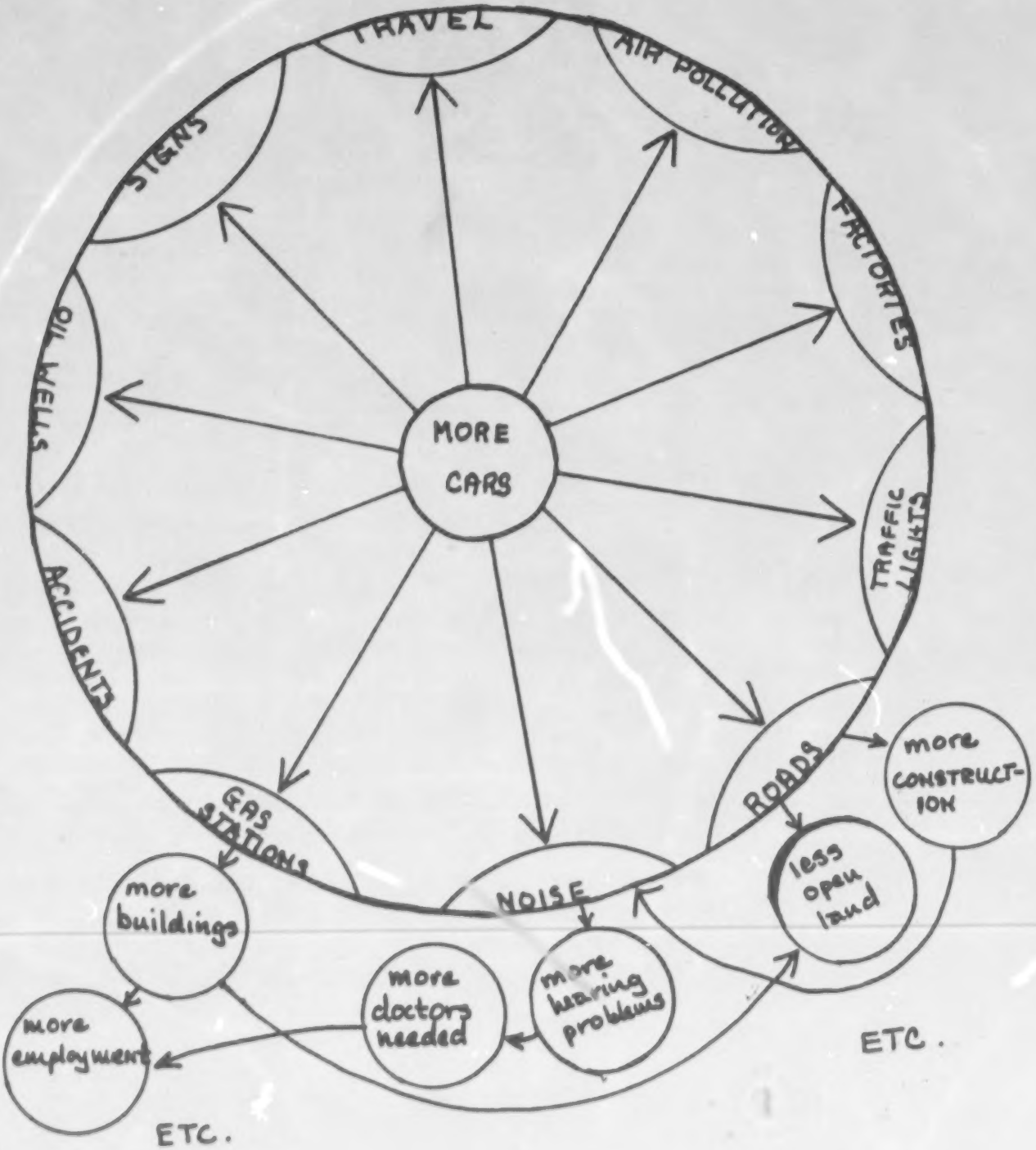
I hesitate, as a teacher, to overload my students with examples of how a wheel has to be drawn or how a summary diagram should look. This robs a tremendous amount of potential creativity from your students. They can be masters at showing you how to use colors, diagrams, etc. Let them have fun as long as you are getting the point across.

WORKING WITH TRENDS

Activities leading into environmental inquiry with young students.

Create thought provoking questions for your students to discuss, write about, but not necessarily come to any decision about at this stage.

1. How did you get to school today? Could you have come any other way? (Comments about air pollution, road use and construction and increased car use should come into play.)



If we have more cars, what else might happen?

2. How do members of our community, or our family, get rid of the leaves we rake in the fall or the snow in the winter? (Children in city environments might discuss run off problems, etc. with snow.)

3. Should I refuse to drink out of bottles or cans that are non-returnable or that can't be recycled?

ETC. Consult Instructor Magazine, Jan. - Feb. issues, 1972, "Teaching Environmental Education With A Focus on Values."

TRENDS

1. Define a trend in your class. What do students think one is? Have them give examples. Provide a simple definition if it helps after some discussion.

   a. It effects people in some way.

   b. It is either increasing or decreasing over time.

   c. You expect it will be increasing or decreasing in the future. Write your definition in large, bright letters on the board or on construction paper where it is clearly visible.

2. Have students select a trend from their community (see #4 below) and do a wheel. (See examples in following pages.)

3. In magazines, cut out pictures of increasing and decreasing trends, ones that you think will effect or do effect your community. Make collages, caption your pictures if you wish; discuss them in class. Older students may wish to do this on a national or global scale although the differences will not be great.

4. Have your students take paper, pencils and clipboards. Go for a walk in the community. With the minimum of discussion have each child list in one column all the increasing trends and in another all the decreasing trends they see while on their walk, (i.e., more sports equipment in store windows, more parking meters, less trees on the side of the road.)

   Find a good place to regroup; the classroom isn't a bad place because students can check through their lists, make sure their items fit the definition and omit any that don't. Discuss as a group any items students might be unsure of as well as the trends that were collected. These lists provide information that can be used for a number of activities such as the wheels.

Teachers: As students complete their collages, wheels, lists, etc. have them hang them around the room for others to see. Children enjoy comparing.

CROSS-IMPACT MATRIX

Jake Plante

The cross-matrix is basically a planning technique for determining the mode and impact of relations between sets of information or events. However, matrixing can be classified as a forecasting method when it is geared to future-time through the cross-reference of trends.

Matrixes or "grids" are used effectively as a means of organizing, classifying, and storing data (e.g. R.B. Fuller's World Game). Subsequently, they may be used as the basis for construction of future scenarios, games, or simulations of existing systems.

As with other forecasting methods, the matrix can be as sophisticated and complex as the designer wishes. The use of computers in matrixing makes it possible to process vast amounts of information and to generate multi-level relationships and time lag factors for when the relationship will be felt. For most purposes though, the cross-impact matrix is more valuable for the insights it provides rather than the actual values it produces.

Introducing the Matrix

One way to proceed would be to have students identify major trends by building futures wheels (see October '74 issue of newsletter). Then, have the students transpose their wheel "hubs" into the parameters of the matrix.

Determining what set of trends to compare depends of course upon the nature of the subject under study. Likewise, the goal of the exercise may be researching complex associations between related trends or else exploring possible interrelationships between trends of a seemingly different character. Most teachers find the exercise more educational and revealing in the former role where surprising outcomes are boundless.

Actual measurement can be in the quantitative or qualitative mode. Several variations are:

a. 1 - 10 scale
b. -2 -1 0 +1 +2 scale
c. + or -
d. descriptive statements
e. pictures

(Note: "negative" or "minus" would denote less value or effect, "positive" or "plus" would denote greater value of effect)

How to read the matrix: At each block ask, "how does the Trend effect the "Variable?" (e.g. a.2 - "how do less cars effect prices?" Less auto production means a decline in the U.S. economy and greater unemployment as a result)

On the next page are two completed variations of the cross-impact matrix:

VARIABLE		CARS	PRICES	ENERGY	POPULATION	COMMUNAL LIVING
		1	2	3	4	5
TREND						
LESS CARS	A	*	US economy declines more unemployment	save energy	people move back to cities from suburbs	push toward greater self sufficiency
RISING PRICES	B	fewer cars because most people can't afford them	*	more energy production because of greater profits	less people because children are perceived as being uneconomical	more home gardens cooking, and "do-it-yourself stuff
CONTINUED ENERGY SHORTAGES	C	fewer cars because no fuel at stations	cost of almost everything goes up	*	oil-base fertilizer shortages cause starvation	more sharing of what is available some alt. energy sources practical only at this level
INCREASING POPULATION	D	demand for cars increases: more cars or mass transit	greater demand means higher prices	less energy for each person	*	more intentional communities
MORE COMMUNAL LIVING	E	people share rides-fewer autos	material sharing and large wholesale orders keep prices down	more efficient use of energy helps ease shortage	lowers indirectly by better educating its people to the problem	*

- less of value
+ more of value

SOCIAL VALUES

TREND	Strength of family unit	Quality of the environment	Stability in our lives	General material and social standard of living	Social responsibility	Dependency	Privacy
Increased mobility	-	-	-	+	+	+	
More complete systems of communication	+ -		+ -	+	+	+	-
Greater pollution		-	-	-	+	+	-
Growing Middle East conflict	-	-	-	-	+	+	-
Higher rate of change	-	-	-		+	+	-
Increasing population		-	-	-	+	+	-

THE MAGIC ENERGY WAND: A SERIES OF ENERGY EDUCATION EXERCISES

Cathy Horvitz

Most people think of energy as fuel for human usage, and curriculum materials for energy education tend to reflect this view. We are used to talking about different forms of energy: radiant, chemical, electrical, etc.; energy and its role in the past; revolutions spurred by the discovery of new ways to harness energy; steps associated with energy usage: harvesting, refining, storing, transporting; energy for the future; resource depletion; the implications of various types of energy usage; the need to conserve energy; and the flow of food energy through natural systems.

Activities such as inventorying different ways humans use energy may lead into an evaluation of their "real" importance, effects, trade-offs, and long-range implications. These all, however, comprise relatively arbitrary cultural processes.

Curricula foci such as those mentioned above are important in that they foster an understanding of how things work now, but they do not deal with how things may change over time, or what meanings they have to individuals and in a larger-than-human context.

Human cultural behavior is subject to several "universal" laws of nature, which fall conveniently into the scope of energy education. These basic understandings (borrowed from the study of physics and biology) subsume the more common view of energy as "the ability to do work." Energy is not only "fuel," but it is a major limiting factor in all environmental relationships. Further, it is the context which permits these relationships to take form. In more specific terms, energy is a prerequisite for change, and thus a crucial element in any conception of the future.

The exercise which follows is an attempt to broaden our definition of energy, looking at it as the common bond which connects all life interactions: past, present and future. It is meant as an introduction, a sensitizing mechanism which could lead into studies of a more specific nature -- an examination of energy as a defining factor in adaptation and evolution, for example.

Setting

This exercise has been used in abbreviated form with adults of all ages and backgrounds in a series of energy interpretation workshops conducted by the Park Project on Energy Interpretation of the National Recreation and Park Association. The exercise, as presented here, grows out of Steve Van Matre's work in environmental acclimatization and is most successful with fourth or fifth grade students, though with proper introduction it can be used at any level.

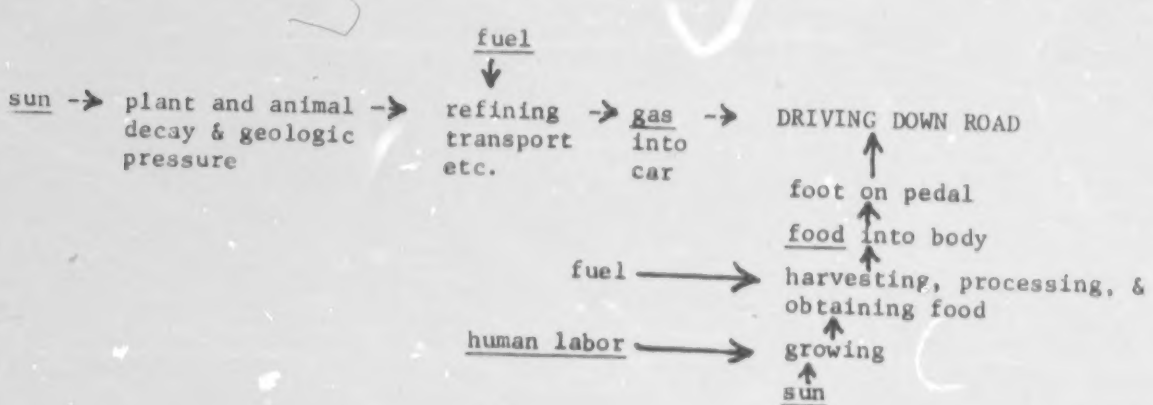
The game is best conducted with all group members sitting together in a circle. Ten or fifteen is optimal size, though more or less may be easily accommodated. Larger groups may be broken down and the game played concurrently after a common introduction. It may be played once or over a series of class periods in conjunction with social studies, science, ecology or English curricula, depending largely on the type of follow-up activities desired.

The only material this exercise requires is a magic energy wand. The wand is best selected from materials the players are familiar with and which are at hand in your immediate location. Any object will work. Be sure in the course of playing this game to pick both natural and human-made energy wands (from twigs, ants, leaves, and rocks to pencils, glasses, shoes and chalk) as initially they may facilitate different thought processes -- though eventually these should merge.

The exercise is aimed toward increasing general environmental awareness and thus lends itself equally well to any setting: rural, urban, indoor or outdoor. Through playing the game, basic underlying relationships which carry through all systems will become evident. Thus, a diversity of settings and wands should be encouraged.

Introducing the Game (A)

Take an object that everyone is familiar with, say: a car, Diagram the energy/change relationships involved in driving that car down a road. What is needed to make the car go? What do we take for granted? Make these links visible. Trace them back step by step to their origin:



Obviously, there are many other relationships involved here as well. The main point is that for any change, and here we are focusing on the observeable changes of a car going from a static to a moving state, an outside energy source is necessary. In this case human and non-human sources are both involved.

The Energy Wand (B)

After running through this exercise, pick a magic energy object -- something that is small enough to hold and pass around. Introduce it as such, saying that because it can magically transform, it is important to get acquainted in the present.

First pass it around the circle letting everybody examine it silently. Encourage them to look at it from all angles. Use all resources available: hands, cheeks... Is there anything that would help you find it if it were in a pile of similar objects: an unusual bump, a smell, a taste, a sound? After it gets around the circle, put the wand in the center and have everybody describe what they see: from close up, far away, above, below, etc. Rotate and notice changes.

Where did you find the wand? Look at it as part of a habitat. Who or what might it relate to in the course of a day? Does it initiate interrelations on its own, or if not, what spurs them on? What about this object invites interaction? How do others see it? How do they feel about it? How would the wand look if it grew to ten times its present size? How would it act differently? What if it shrunk? Changed colors like a chameleon? Glowed in the dark? When you feel the discussion is dying down, begin the game.

The Playing Cycle (C)

Pick up the magic energy wand, holding it in both hands. Stretch your arms out fully in front of you and say, "I am a magic energy stick (or whatever)." Transfer the stick to your left hand, holding it outstretched to the side, and say, "In the past I was a tree." Finally, transfer the stick to your right hand and say, "In the future I will be a song." The progression in this case moves from a tree to a branch to a stick to paper to somebody composing a song and printing it on the paper to someone singing the song.

Pass the magic wand to the person on your left and go around the circle in this fashion, each player taking the wand and going through the present - past - future pattern. It's OK if there is repetition, but there is no limit to right answers. In fact, there are no wrong answers (let the players discover this for themselves). The game should be an exercise in imagination, a modification of the brainstorming approach. Pressures defeat the purpose. The first time through, there is likely to be a focus on concrete, directly observeable relationships, but over time this will change. This game can be surreptitiously "practiced" anytime, anywhere...

Key Concepts for Follow-up Discussion

*A given system cannot generate more energy than it has at any one moment, and will tend to lose energy. (First and Second Laws of Thermodynamics)

*Change is always associated with energy, and may be defined by the gain or loss of energy within any given system in relation to its surroundings.

*Everything is always changing. Matter cycles in the Universe, ever becoming something else.

*Some changes are fast and visible to the human eye. Others are slow and only emerge when we look at gross patterns over time.

*When energy flows are slow enough and our eyes cannot detect their changes, we may refer to them as storages, and we name them (table, book, twig, ant, etc.).

*Everything is connected to everything else, and energy is the common bond.

Follow-up Activities and Variations

1) When everybody has a good grasp of the concepts, repeat the game and see how the group can make the largest/longest past-to-future leaps. This can be measured in terms of time, or number of energy steps. Divide into teams or do it individually.

2) Imagine yourself in the past and in the future. By the rules of this game, what would you like to be, and what were you? Draw a picture, write a story or act it out.

3) See how many different kinds of energy conversions you can leap through chemical, radiant, mechanical, psychic, etc.

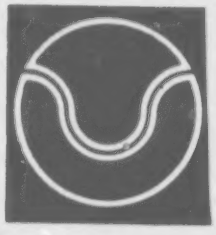
4) Take a leap and see how many different energy patterns you can specify that will get you to the same end point. What are the differences in energy (as fuel) use? What are the different social implications in each scenario? Starting with the sun and leaping to preserves on a slice of toast, an obvious variation would be growing the berries yourself or a commercial process, for example.

5) Think of two objects that you like. What do they have in common (now)? How far back do you have to trace their evolution until you reach a common source? What is it? Is there more than one common point in the past? Trace them to a point in the future where they will be united as one thing...

6) Look at a short leap of two or three steps. We have stated that everything is connected in one way or another. You can show direct connections by tracing out effects. What are the first order effects of the energy leap? How does the change you have designated directly affect the environment? What are second and third order effects? These may be documented as wheels, cross-impact matrices, graphs, flow charts, pictures, etc. (see previous FII issues for more specifics).

7) Try setting time frames for energy leaps: Five years ago I was..., twenty-five..., five billion..., and the same in the future.

8) Have players bring in their own energy wand objects and/or have them teach the game to younger players.



SUN SENSE AND SCIENCE

by

Jim Masker

As an educator, I find solar energy to be especially relevant in the classroom today because it allows students to be involved in a process that is as old as human history itself - "Sciencing." Too often the extent of science curricula is learning about scientists and replicating experiments which have the "correct" answers contained in the teacher's edition edition, rather than actually participating in the painstaking hypothesizing/testing/rehypothesizing experience that real life scientists go through as they attempt to find optimum solutions to real life problems.

A necessary part of sciencing and perhaps educationally one of the more significant tools for student growth is the realization that in areas where experts have yet to determine optimum parameters, every blind alley or unsuccessful experiment is as valuable in learning how to do something as is a continuous string of "right" experiments. In fact, one can only begin to delineate appropriate from inappropriate information after a considerable number of experiments have shown what procedures lead to optimum results.

The body of knowledge about solar energy has yet to be finalized and because it is by nature open to non-technically sophisticated research, it is ripe for sciencing, especially by lower and middle school students who are constantly exploring and being inquisitive about their environment. Teachers should not hesitate to expose their students to solar energy simply because they themselves do not understand all there is to know about the topic. It might make a unit on solar energy even more meaningful for the class if they can actually see their teacher reaffirming the notion that learning can and should be a never ending, continuous process which does not end with a college diploma.

The following is a two part explanation of how you and your class can begin the process of sciencing in this new and valuable field. Part One explains the basic principles of how solar energy works and how to construct an inexpensive solar collector. Part Two presents an experiment to test your collector, a list of potential variables for which the class may want to experiment, and finally, some activities that might heighten the educational impact of the experience for the class.

Part One

A. Principles - Most solar collectors throughout the world are based on the same fundamental principles. Once you understand these principles, to optimize your collector design is the purpose of further sciencing.

1. Principle One - When sunlight strikes an object, whether solid, liquid, or gas, it tends to heat the object. Briefly, this happens because the sun's energy (sunlight) tends to excite the atoms and molecules of the particular object. This excitation causes friction between the various atoms and molecules which

results in what we understand to be heat. Because of their density and light absorbing qualities of their surfaces, different materials will react to the sun's energy by giving off various amounts of heat.

NOTE: Students usually have internalized and understand this principle without necessarily having to verbalize it. This is because they have been sciencing since birth but have not always been told this is what they were doing. A couple exploratory questions should let you know whether or not some introductory sciencing will be in order. Ask them if they have ever walked in their bare feet during the summer on a black top road or whether or not they have ever sat on a car seat that has been exposed to the sun.

2. Principle Two - Heat rises. This can be determined by having students hold their hands two inches away from the side and then the top of a 100 watt bulb or a candle.

The basic structure of a collector, therefore, is to provide the sun with a material to strike in order to produce heat and a structure to contain the heat that is given off. The goal of the class's sciencing efforts should be directed toward determining the optimum materials and construction necessary to create the greatest amount of heat while losing as little heat as possible.

B. Building A Collector -

1. Materials -

- large boot box (approximately 11 inches by 16 inches) from a local shoe store
- several tin cans with the ends and paper removed
- a piece of transparent polyethelene large enough to cover the box with 1 1/2 to 2 inches extra on all sides
- a can of dark green metal paint and a brush
- glue
- a pair of tin snips or some other metal curring device
- scotch tape
- hammer
- a pair of scissors
- several heavy books that fit inside the boot box to be used as weight

2. Procedure - Cut the tin cans so that they unroll and flatten it into a ractangular sheet when pounded with the hammer. Cut and piece the flattened cans until they fill the bottom of the boot box without overlapping.

Put three coats of paint on the cans and let them dry thoroughly after each coat.

While the cans are drying, cut a hole approximately 1/4 inch wide in the middle of one of the shorter sides of the boot box. If you have a square box, cut the hole in the middle of any side. This is where the thermometer will be placed during the experimental phase.

Once the cans have dried, place a more than liberal amount of Elmer's glue on the bottom of the boot box and place the cans painted-side up on the glue. Place the books on top of the cans to weight them down and allow to dry overnight.

Tape the piece of polyethelene over the top of the boot box, being certain it is taut and wrinkle free.

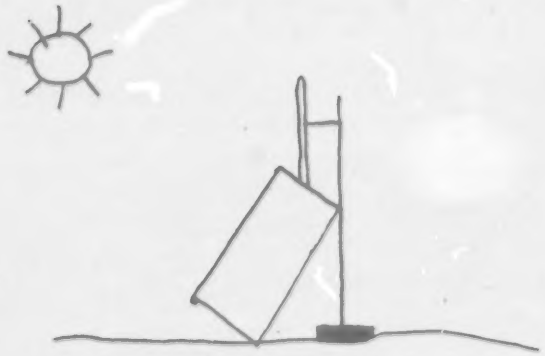
Part Two

A. Experiment

1. Materials -

- solar collector
- a laboratory thermometer
- a stand to rest the collector against and a test tube holder that fits over the stand and holds the thermometer securely
- a stop watch or a good watch with a second hand
- a piece of notebook paper and a pencil
- a piece of graph paper

2. Procedure - Being careful not to let any direct sunlight fall onto the collector until you are prepared, set up your apparatus as in the diagram below. Do not let the bottom of the thermometer touch the bottom of the collector. Try to insert it at least 1 1/2 inches into the collector.



Once you have set up the apparatus properly, have a student record the temperature inside the collector before exposing it to direct sunlight. Perhaps a towel or small sheet could act as a shade producer. Then, expose the collector to the sun, checking to make certain there is as little shadow on the metal bottom as possible.

Have the person keeping the time tell the student watching the thermometer when a minute has passed. Another student should record the temperature on the sheet of notebook paper. Record the temperature every minute for at least twenty minutes.

Repeat this procedure at least once more on another sunny day.

Taking the cecorded temperatures, have your students make a graph of their results. The horizontal axis is labelled time, while the vertical axis is labelled temperature. Discuss the findings.

B. Other Variables - Remember that the goal of this sciencing effort is to optimize the amount of heat generated while minimizing the heat loss. Therefore, it is conceivable that your students could be broken into research groups to test for certain variables. The list provided below is offered as a suggestion. Students should be encouraged to think of variables themselves.

- try different materials for the sun to strike; both metals and non-metals
- what transparent material is optimum?
- what color paint and how many coats is most efficient?
- does insulation make any difference?
- does the shape and volume of the box make any difference?

C. Activities -

1. Get speakers from local colleges, PIRG groups, etc. to come to your class and speak on topics associated with energy.
2. Take field trips to solar heated structures.
3. Start a bulletin board in the hallway for solar energy articles and experimental results.
4. Present your findings to a school assembly.
5. Have your students be "expert" guest lecturers in other classes.
6. Organize a parents' night with displays and oral presentations.
7. Have your students write articles for your local newspaper or television station.
8. Publish a small "scientific" journal of the classes' findings.

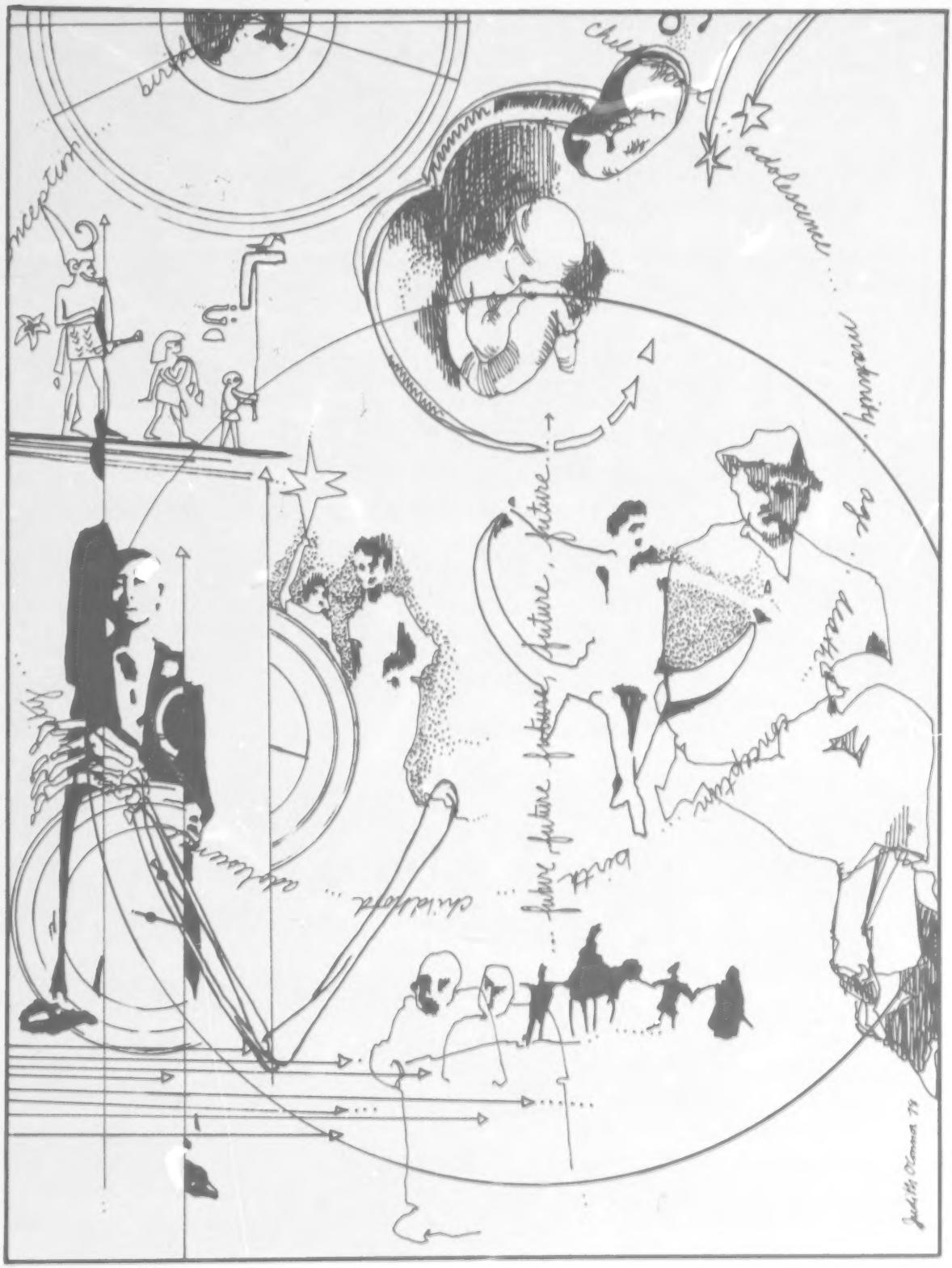
JAN

Future Studies Program
School of Education
University of Massachusetts, Amherst

Fall 1978

Futures

Information Interchange



In This Issue

Vol. VI No. 1

Articles

Objectives for Energy Conservation in Secondary Education

Computer Literacy Quiz

The History of the Future: A Multi-Dimensional Futures Approach to the Study and Teaching of History

Applesauce/Learning Tomorrows '79

Social Change Theorists Opinions on A Re-Definition of Knowledge as Individuation

Learning Tomorrows: The UMass Conference on the Future of Education

Smart Electronic Games and Video Games

A Synthesis of Perceptions on Learning, Maturing, and Purpose

Group Grading as a Means of Teaching Cooperation

The Need for Alternative Decisional and Problem-Solving Approaches in Future Studies Curriculum

Consulting

The Future Studies Program of the Univ. of Massachusetts' School of Education offers quality educational consulting by experienced doctoral candidates and faculty. The diversity of the field of futuristics in education provides for a similar array of expertise among the Future Studies staff and Program members at UMass. Areas of involvement and consulting include: forecasting methods; curriculum implementation and evaluation; innovative teaching materials and strategies; computer-based instruction; energy usage and conservation; planning; technological literacy; and alternative education.

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OBJECTIVES FOR ENERGY CONSERVATION CURRICULUM IN SECONDAY EDUCATION

Carolyn J. Robadue

Since the early 1970's, energy conservation has been an issue of national significance in the United States. It is an issue that has significant implications for all individuals regarding the manner in which they live. Energy resources, especially the nonrenewable fossil fuels, can no longer be regarded as luxuries which can be wasted indiscriminately; therefore, energy conservation education should be an essential part of the school curriculum. A selection of objectives and learning activities for the secondary level classroom is presented below.

The need for energy conservation exists in every sector of society, from industrial manufacturing processes to private transportation. Within this range there are many ways in which the individual can make a significant impact to reduce energy consumption and improve the efficiency of its use. It is important, then, that the junior high and high school student be given the opportunity to learn what her or his responsibility is on the personal and community level.

The following is a sequential list of objectives for energy conservation education that can be applied to nearly any secondary classroom. The aim is that the students will be able to perceive themselves as not only part of the energy demand problem, but also as part of the solution, in order that they might take positive action to implement the concepts of energy conservation in their homes and in their communities.

Objectives and Suggested Learning Activities

Objective 1: *To enable the secondary school student to describe how she or he is a part of the national energy situation.*

- Students should be given an introduction to the issue of energy supply and demand on the national level, the various technologies for supplying energy, and the end use of various fuel types, e.g. the home furnace, an electric power generating plant, or motor vehicles.

- Divide the class into small groups, each choosing a special topic to research as a team, and then present their findings to the entire class. Encourage the use of creative means of presenting the topic so that they can relate energy conservation to other sectors of society (i.e. the arts, mass media, inflation, etc.).

Objective 2: *To enable the student to evaluate her or his personal and home energy consumption behavior.*

- Show the students how to do a personal energy survey. These surveys are usually available in energy curriculum materials developed by state and local agencies.

- Discuss the results of the survey as a class, looking for relationships of similarities and differences, priorities of energy use, and suggestions for reordering priorities that need to be changed.

Objective 3: *To enable the student to design a strategy for reducing her or his personal and home energy consumption.*

• The students should be given an introduction to the concepts of home heat loss, appliance efficiencies, motor vehicle efficiencies, and fundamental energy conservation strategies.

• Each student should apply this information toward developing a list of conservation steps in order of priorities.

Encourage the student to try implementing these steps at home and to share comments on the successes and difficulties encountered.

Objective 4: *To enable the student to organize a cooperative effort to induce energy conservation in her or his peer group.*

• Assist the class in organizing and putting on an "energy fair" for the school. Allow the class to choose a theme and the kinds of activities to take place. The focus of this activity should be on cooperation in the task of disseminating ideas and information which they have learned.

• Another activity is for the students to initiate an energy conservation campaign aimed at their own school's energy consumption and wasteful practices. This is another opportunity for cooperation and creativity.

Objective 5: *To enable the student to identify problems and solutions for energy conservation in the community at large.*

• The students should now begin to understand how energy is used and and wasted in their community. They can now begin the task of investigating in greater detail the local patterns of consumption and practical steps towards conservation. Again, in such an investigation, the emphasis should be on cooperation, since that is a real way in which larger scale issues are solved. The results might be presented to other classes or to the entire school.

Objective 6: *To enable the student to organize a cooperative effort to induce energy conservation in the community at large.*

• Based on the findings under Objective 5, the students can now focus on one or several specific local issues and undertake to disseminate information, ideas, and recommendations to various community organizations, institutions, and residents. This is an opportunity for the students to learn about the use of mass media and "grassroots" organization.

• It is also possible that the students might want to get the community involved in sponsoring an "energy fair" of greater proportion than the one which the students held.

With these objectives in mind, a student's learning experience should take her or him from a point of recognizing the problems and needs in energy conservation to determining personal applications in the home, to relating known information and ideas to a peer group, and, finally, to a point of understanding local energy issues that affect change in a group which is larger than their peer group, namely the local community. The intended result is that

the student will understand that she or he is a part of the problem/solution and that cooperative work with others can be undertaken to achieve desired solutions.

In summation, it is the responsibility of the educator to provide each student with an opportunity to learn to be actively involved in the problems of the world and its future.

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COMPUTER LITERACY QUIZ

1. All computers understand the language BASIC because, as its name implies, it is the most fundamental of computer languages.
2. For any problem within its capability, a computer can always solve it more quickly and cheaper than can be done manually.
3. Example of random access storage devices include:
   1. core and disk
   2. magnetic tape and punch cards
   3. disk and magnetic tape
   4. paper tape and punch cards
   5. all of the above
4. M.I.C.R. stands for magnetic ink character recognition, and is used on bank checks in the United States.
5. Which of the following does not manufacture and sell computers?
   1. Control Data Corporation
   2. IBM
   3. Digital Equipment Corp.
   4. Honeywell
   5. American Telephone and Telegraph Company
6. A typical CAI drill and practice program:
   1. works only when one is teaching elementary arithmetic
   2. aks the student questions and checks his answers
   3. forces all the students to work the same set of problems
   4. allows three incorrect responses before going on to the next problem
   5. none of the above
7. Although learning a machine language is difficult, once one has mastered it, he can write programs that will be understood by any machine.
8. The best computer programs for playing chess and checkers are based upon having the computer memorize tens of thousands of board positions (i.e. rote memory).
9. It is now possible to manufacture a single large-scale integrated circuit, called a chip, which contains all of the circuitry for a CPU.
10. The concept and use of punched cards was developed:
    1. before 1900
    2. about 1920
    3. about 1940
    4. about 1960
11. PLATO is an educational computer system which uses a gas plasma display terminal.
12. In the early days of computers, all programming was done:
    1. in FORTRAN
    2. in BASIC
    3. in machine language
    4. in UNIVAC
13. The Turing "Imitation Game":
    1. has a computer imitate a business environment to train executives in decision-making.
    2. has a person imitate a computer to find program errors.
    3. has a computer simulate a complex situation providing a detailed study of alternative effects.
    4. has a computer pretend to be human, demonstrating artificial intelligence.
14. The science of control and feedback theory is called cybernetics, and Norbert Weiner contributed a lot to this area.
15. One threat to privacy comes from the willingness of most people to provide information about themselves voluntarily.
16. Which of the following is a characteristic of a problem which is well-suited to solution by the computer?
    1. Problem solution involves value judgments
    2. All necessary decisions are quantifiable
    3. The problem is ill-defined
    4. The solution to the problem is needed only one time
17. The largest user of computers in the U. S. Government is:
    1. The Internal Revenue Service
    2. The Census Bureau
    3. The military
    4. Congress
    5. None of these.
18. When one is buying a computer system, he might purchase hardware and software from two different companies.
19. Magnetic tape is an effective medium in operations requiring frequent access to data on a random basis.
20. Very large computer programs are apt to contain undetected errors even after the programs have been used for several years.
21. NCIC is a method whereby checks printed with a special ink can be machine read.
22. By 1950 about 1000 electronic digital computers had been manufactured and placed into service.
23. The fastest core memories have retrieval times of about one millisecond.
24. Using an 8 bit code (such as on magnetic tape), how many different characters can be represented?
    1. 8
    2. 16
    3. 32
    4. 256
    5. 512
25. A computer's memory can think about and solve a problem much in the same way as a person's brain works on a problem.
26. A major problem with computerized data banks is guarding against erroneous data getting into the system.
27. A disadvantage of punched card machines is that the speed of processing is limited by the movement of mechanical parts and devices.
28. Which of the following is not an example of the administrative application of computers in education?
    1. Payroll
    2. Scheduling
    3. Student records
    4. Computer-assisted instruction
29. Why do computer scientists write computer programs to play games?
    1. Computer scientists have lots of fun doing this.
    2. To communicate the ability of the computer.
    3. To study the nature of problem solving.
    4. All of the above.
    5. None of the above.
30. Computer costs (measured in terms of computations per dollar) have leveled off in the last five years.

Answers on page 35

"THE HISTORY OF THE FUTURE": A MULTI-DIMENSIONAL FUTURES APPROACH TO THE STUDY AND TEACHING OF HISTORY

by

Neal A. Norris

It has been widely suggested, generally accepted, and finally demonstrated that social studies education, particularly history, is in deep trouble.[1] Both as a profession and as a discipline, history has suffered a series of debilitating shocks which indicate that some fundamental re-evaluation of methodological perspective is required.

Numerous rationalizations have been offered to explain the present malaise felt by many professional historians and social studies educators. Everything from changing teacher certification requirements, decreasing student enrollments, and weakening statutory support to decreasing job opportunities and changing student attitudes have been used to explain the erosion of the traditionally central position history has enjoyed among the social sciences. Although each of these developments may in part explain the newly revised status of history education in the schools, *social studies teachers' own working conceptions regarding the nature of their methodological framework may have become, inappropriate measure, a fundamental element of the lingering crisis.*

Some substantial efforts have been made by serious historians in recent decades to incorporate new ideas and directions into their teaching with the hope of revitalizing the field. As early as the turn of the century, progressive historians such as Beard, Turner, Becker, and Robinson began to question the utility of traditional historical methodological perspectives and brought new economic and spatial dimensions to bear upon historical interpretation. Intellectual history--as well as its institutional and social offshoots--have also contributed a new methodological and structural focus to popular historical conceptions.[2]

During the sixties and early seventies a number of new topical formats (e.g., ethnic and urban studies, and pop culture, music, and media) were included in the curricula of many social studies departments in an attempt to cope with the ever-increasing charge of irrelevancy aimed at traditional history courses by a changing student body and society.[3] Environmental, multi-cultural, global, and future studies materials have also been used in a growing number of social studies and science courses.

It seems that the net result of this growing repetoire has been some increase in student awareness of the global and interactive nature at present "macro-problems." On the other hand, this awareness does not seem to be accompanied by a mature understanding of the fundamentally dynamic meaning, method, and matter of history for present and future generations. *Despite the recent wave at curricular reform which spawned the "new social studies" based primarily upon the inquiry approach, social studies teachers at all levels have continued to relie upon the traditional, sequential chronology of facts from the past to sustain flagging student interest.* In the process we have succeeded in blunting student understanding of the dynamics of history by ceaselessly requiring confrontation with functionally moribund images of that past.

The study of history, however, is fundamentally concerned with causal relationships among the sometimes conflicting, sometimes competing, sometimes complementary human actions within space and time. The narrative interpretation of people, places, things, and events occurs within this dimensional space/time framework. History, at least within the known space and time dimensions, is composed of three additional aspects: the past, the present, and the future.

Every person carries a whole cluster of images of the past about with him or her; indeed, this past, created from previous learnings, experiences, and memories, has become for many people a relatively fixed set of images that influence almost every aspect of behavior in some way. Unfortunately, past time and space have often been viewed as would frozen slices of some long dead laboratory specimen and have appeared as unalterable "fact"—a fiction we frequently impose upon learners by the very way in which history is conceived and taught.

Although history is comprised of space and time dimensions including the past, present, and future, students typically learn only of selected images of the past refracted by historians' somewhat flawed perceptual and methodological prisms. The present, if discussed at all, is only alluded to or mentioned briefly in passing. And as for the future—either it is beyone the scope of conscious concern or it is treated as a questionable premise from the beginning.

Professor Trygve Tholfsen has insightfully pointed out, "...every individual is defined not only by his own past, but also by the past that persists in the ideas and institutions that shape his thought and action." The past becomes then "an omnipresent reality."[4] The consequences (for the present and future aspects of historical space/time) of this fixed image orientation toward the past are truly staggering. As a result, the present is often perceived as "motionless movement" slowly animated by the concrete definiteness of "the present moment." Images of present time and space seem incremental, disconnected, and incomplete in relation to the rigidly perceived "hard facts" of the past.

The seeming rapidity and magnitude of change in recent times appears to reinforce this feeling among older as well as younger students. The staggering complexity of the present moment is ostensibly threatening the traditional validity of the historical past we have conveniently constructed for ourselves. *If nothing else, our prevailing mythos has allowed us to face change rather optimistically by redefining it in terms of progress toward a rather vague, romantically idealized, utopian future.*[5]

On the other hand, some Americans are beginning to sense that we are facing nothing less than what Arthur Schlesinger, Jr. has called a full-blown "crisis of confidence"[6]—a crisis which has cast doubt upon the validity of our traditional images of the past, undermined our efforts to comprehend the present, and disintegrated our hopes for a utopian future. No longer do these people view technology as a trusted servant but rather see it as a growing menace. The peoples of the highly industrialized countries of the world are exhibiting a concern that they are being increasingly disenfranchised by the imponderable scope of the new super-technologies. To some—to many—the once wide-open, progressive frontier image of the future is being fenced into innumerable parcels of hopeful despair.

Glib progressive images have dimmed in the face of some "hard facts" from the present: two world wars, overpopulation, energy depletion, environmental degradation, bio-genetic innovation, and weapons technologies.

Partial fault for this state of affairs may, sadly enough, lie with the narrow scope of some educators' perspectives, particularly in the social sciences. A new approach to the study and teaching of history seems necessary, one that assimilates the present and future dimensions into its working methodological framework. The future is where space and time may expand, intermingle, and grow to include diverse images of perceived options. It is a dimension in which we may find the hope of discovery and consummation, as well as the possiblity of loss and expropriation.

Indeed, historical causation is not, as is usually thought, either unidimensional nor unidirectional. The nature of the relation between the past, present, and future is rather dynamic and reciprocal. It is as the Dutch sociologist, Fred Polak, expressed it over a decade-and-a-half ago:

> Past and future come together with a mighty clash in the present, and out of the reverberations of this clash the images of the future emerge. These in turn determine the shape of both the present and the future, in an endless chain of action, reaction, and interaction.[7]

More and more perceptive educators are becoming aware of the powerful relationship between history and its future aspect. Dr. Norman Henchey, Professor of Education at McGill University, has actively included history in his theoretical attempt to build "a framework for the study of the future." This historical approach underlines the usefulness of trend analyses, comparative studies, and scenario construction. He points up this relationship directly when he stated that:

> Historical approaches in a sense represent the most obvious orientation for the study of the future: the future as an extension of the past and present, the dialectic between prospective and retrospective. Rather than competing with future studies, history offers a good part of the substance from which we build the future and in its analysis of trends--their causes and effects--it reminds futurists of the subjective character of all interpretation of data, the importance of criticism, and the need for perspective.[8]

"The History of the Future" course which I have developed and taught during the past four years to grades 7-16, was created to offer students just such a broader, multi-dimensional approach to the study of history. I have attempted throughout the course to expand the traditional historical perspective to effectively incorporate the present and future dimensions into the sphere of legitimate concern by using the future as an organizing concept.

Fundamentally, the course is designed to prepare students to think in terms of making choices from perceived alternatives that may be considered when attempting to solve problems relating to either the past, present, or future aspects of historical space and time. In broad terms, the course begins with some "very hard facts" from the present regarding humanity's rapidly expanding capability of destroying itself in exotic and painful ways.

The first two weeks are devoted to an introductory discussion of the concepts of change, progress, and the future, based upon several readings and films depicting the human suffering of the Japanese populations at Hiroshima and Nagasaki immediately following the atomic explosions in early August of 1945. Further dialogue/discussions consider the current implications of the destructive capacities of the growing club of nuclear powers. The long-range psychological, genetic, and environmental damage of the bombs are explored to sensitize students to the frightening magnitude of existing but somewhat overlooked global realities. Students at every level seem to comprehend the immediate implications of the drastically fundamental disruption engendered in nuclear war if they are given a map of their hometown upon which to graph the destructive dimensions of a twenty-megaton bomb exploded on the town hall.[9]

Once the hidden dimensions of the possible consequences of these realities are discovered, the class begins to deal with what I have called "the mythical component of present perceptions" by discussing at length some twenty-five of the most common myths Americans have acquired throughout their history from various sources. Prominent in these discussions are such myths as agrarianism, the melting pot, the Noble Savage, the American mission, the Benjamin Franklin syndrome, the Cherry Tree Fable, and the Better-To-Be-Single-And-Young and the Married-And-Secure syndromes. Two-to-three weeks are spent identifying and discussing these myths, as well as the role they have played in the development of the student's--and society's--value system. American and German mythologies are also compared to help students better understand the power of myth in society.

At this point students are introduced to the concepts of historical fallacy and causation[10] and are given the opportunity to apply these concepts critically to several readings. When students have completed this study, several class sessions are devoted to discussing various linear and cyclical theories of historical development and their chief proponents. At the high school and college level, Hegelian dialectic Idealism and Marxian Materialism are examined in some detail, as is the Structural-Functional method used by Chalmers Johnson and others in their analysis of the revolutionary phenomenon.[11]

Students at all levels have enjoyed the challenge of developing their own visualization of historical development, bringing a concrete model of that visualization to class, and explaining it to other class members. The various models and their explanations lead directly into the next portion of the course: the relationship of space and time conceptions to historical understanding.

These concepts are explored by viewing Experiments in Motion Graphics (1968) and Powers of Ten (1968) and discussing readings that relate various perceptions of space and time. There are several approaches to this section, the most exciting of which involves consideration of the whole population/food issue, Marshal McLuhan's "global village" concepts, and the Spaceship Earth" and newer "Earthmanship" metaphors. Students' temporal and spatial horizons are further broadened by debate concerning extraterrestrial life-forms, matter, anti-matter, proto-matter, alternative, and parallel universes; metagalaxies; geological epochs; neutrinos; and tachyons.

The class proceeds to the next segment of the course--learning to cope with complex problems--by learning and using various futures planning techniques. Brainstorming, trend analysis and extrapolation, cross-impact analysis, the Delphi method, the Culture/Society Model[12], and scenario-writing are presented as some of the more popular tools to use in generating, analyzing, and evaluating various options regarding current or future problems. Most students have been captivated by the accuracy of past predictions, forecasts, and scenarios of such people as Leonardo daVinci, Alexis de Tocqueville, Charles P. Steinmetz, Edward Bellamy, and others.

Students then begin to apply these tools to a near-future thought problem. In one class, for example, students were placed in the year 1990 in the position of a newly elected President of the United States who was facing a potentially explosive dilemma. A bill had just been passed by a narrow margin legalizing the manufacture and sale of renucleated ova to all normal individuals twenty-one years of age or older. Students were to reach their decision to either reject or pass the bill by: (1) developing a scenario tracing the converging historical circumstances that led up to the present choice/point, and (2) using the Culture/Society Model as a basis for developing two exploratory forecasts describing (a) the most preferable future Culture/Society that could realistically be achieved if the bill were enacted and (b) the most probable future Culture/Society that could occur.

This "thought synthesizer" confronts the student with a truly serious--and fundamentally moral--problem to which may be applied some of the previously discussed tools as a means of stimulating a fairly sophisticated generation, analysis, and evaluation of alternatives from which a final solution may be chosen.

During the final weeks of the course, which takes place both in and out of the classroom, students are learning about new developments and trends in society. This final segment concentrates upon some possible new attitudes and beliefs that may prove helpful to the creation of a new value structure which would allow both individuals and societies to deal effectively with what some have termed the coming societal transformation.[13]

"The History of the Future" has been taught several times in its entirety at the college level; and parts of the course have also been taught successfully at both junior and senior high school levels. Students have generally expressed their enthusiastic approval of the multi-dimensional, interdisciplinary approach; the wide-ranging readings and handouts; the media presentations; and the fundamental nature of the inquiry.

Student comments and pre/post test results indicate that such a future-inclusive study of history is a valuable--and viable—alternative to the more traditional approaches commonly used. As such, the possibility of expanding the legitimate domain of historical concern may at last be realizable.

Teaching history from such a holistic perspective may indeed promote this possibility among professional practictioners. Perhaps such a committment to expanding the field of study may also serve as one means by which to intrinsically revitalize the study and teaching of history.

NOTES

[1]See Richard S. Kirkendall, "The Status of History in the Schools," The Journal of American History, LXII, 2 (September 1975), 557-570, for a statistical analysis of our current dilemma; C. Vann Woodward, "The Future of the Past," The American Historical Review, LXXV (February 1970), 711-726, for a cogent statement of professional concern; and Hugh B. Hammett, Charles F. Sidman, Thomas Longin, and Henry D. French, Jr., "Can the Teaching of History Survive 1984?" The History Teacher, X, 2 (February 1977), 229-248, for a broad analysis of causes and possible solutions.

[2]Gene Wise, "The Contemporary Crisis in Intellectual History Studies," Clio: An Interdisciplinary Journal of Literature, History, and the Philosophy of History, V, 1 (Fall 1975), 55-71

[3]For a more recent edition of this issue, see David H. Donald, "Our Irrelevant History," The New York Times, September 8, 1977, and Edward L. Keenan's reply in The New York Times, September 26, 1977.

[4]Trygve R. Tholfsen, Historical Thinking: An Introduction (New York: Harper and Row, 1967), 248.

[5]See especially Charles Van Doren, The Idea of Progress (New York: Frederick A. Praeger, 1967) and Bernard James, The Death of Progress (New York: Alfred A. Knopf, 1973)

[6]Arthur M. Schlesinger, Jr., The Crisis of Confidence: Ideas, Power, and Violence in America Today (Boston: Houghton Mifflin, 1969).

[7]Fred L. Polak, The Image of The Future: Enlightening The Past, Orienting The Present, Forecasting The Future (New York: Oceana, 1961).

[8]Norman Henchey, "Building a Framework for the Study of the Future," The World Future Society Bulletin, XI, 5 (September-October 1977), 1-9.

[9]For a highly graphic and recent article, see Erwin Knoll and Theodore A. Postol, "The Day The Bomb Went Off," The Progressive, (October 1978), 16-21.

[10]The "Common Historical Fallacy" and "Causation Checklist" Handouts were compiled from A Preface To History by Carl G. Gustavson, How To Study History by Norman F. Cantor and Richard I. Schneider, and The Modern Researcher by Jacques Barzun and Henry F. Graff.

[11]For an applied version of this theory, see Chalmers Johnson, Revolution and the Social System (Stanford: The Hoover Institution on War, Revolution, and Peace, 1964).

[12]Neal Norris, "The Culture/Society Model: A Multi-Dimensional Context for Alternative Futures," Futures Information Interchange, IV, 1 (April 1977), 16-19.

[13]Willis W. Harman, "The Coming Transformation," The Futurist, (February and April 1977 issues).

A BRIEF COURSE OUTLINE
FOR
"THE HISTORY OF THE FUTURE"

1) First Week: "Introduction to the Future: General Perceptions"

2) Second Week: "On the Concepts of Change, Progress, and the Future"

3) Third Week: "The Mythical Component of Present Perceptions: the Role of the American Mythos"

4) Fourth Week: "Beyond the Mythos: Reality and Metaphor for the Future"

5) Fifth Week: "How We Think About Society and the Future: Ideas of Historical Development"

6) Sixth Week: "How We Think About Society and the Future: More Ideas of Historical Development"

7) Seventh Week: "How We Think About Time and Space: More Space and Less Time"

8) Eighth Week: "How We Think About Time and Space: A Multi Dimensional Forumlation"

9) Ninth Week: "How We Look at the Future: Some Futures Techniques"

10) Tenth Week: "The Culture/Society Model: A Discussion-Explanation Using Tracers"

11) Eleventh Week: "The Culture/Society Model Applied: How You Will Be You"

12) Twelfth Week: "New Developments and Trends: On the Cutting Edge"

13) Thirteenth Week: "Possible, Probable, and Preferable Futures: Alternative Scenarios"

14) Fourteenth Week: "Possible, Probable, and Preferable Futures: A Values Conclusion"

15) Fifteenth Week: "Concluding Activities"

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SOCIAL CHANGE THEORISTS OPINIONS ON A RE-DEFINITION OF KNOWLEDGE AS INDIVIDUATION

Kathleen Chatwood

A major contention of futurists regarding education is that schools not only present bodies of knowledge, facts, and skills, but also impose values and limited societal world views upon students. Education currently directs and limits the growth of the individual toward pre-conceived social imperatives without offering other value dimensions with which to view the society and one's place in it.

This article presents some commonly-held assumptions about knowledge, the perceived "end" of educational "means." It charges that knowledge is seen only as a process promoting acculturation, instead of as an experience facilitating individuated growth and that individual's concern and reciprocal responsibility for her/his community's welfare. Individuation, as distinguished from the term "individualization," means practicing a broader, more open view of knowledge's purpose to include presentation and cultivation of both personal and social alternatives in the classroom. Knowledge becomes individuation when the learner manipulates and prioritizes the direction and content of learning. It becomes individuation when parents and community members are involved thoroughly in decision-making and the operation of the school. *In essence it is personal empowerment as fostered in the learning process.*

The article will present an overview of the opinions of leading change theorists who argue that the purpose of education is that of individuation. Ivan Illich, Bowles and Gintes, A.F. Schumacher, and Paolo Freire's opinions will be cited. All of the forementioned authors, with varying degrees of emphasis, stress that the educational encounter in the majority of American schools promotes the growth of a subordinate and powerless mentality among people in our culture. Schools encourage the individual to accept externally-imposed conditions rather than make decisions and actively structure contingencies in the society which influence his/her life. The authors call for a re-orientation of schools and a redefinition of knowledge to promote individual thought, awareness, and action in a world desperately needing the new alternatives.

The educational theorist, Zvi Lamm, in his article "The Status of Knowledge in the Radical Concept of Educa-

tion," explores the implications of two commonly-held assumptions about the value of knowledge in society:

1) its use-value in attaining practical skills with which to function in the society, and

2) its intrinsic ability to develop the human cognitive capacity, and to promote acceptable ways of using that capacity in the culture of which one is a part.

These viewpoints can be seen as representing the social process of acculturation.[1]

In the first case, the validity of learning is measured by its utility in society. Education communicates knowledge and practical skills according to the information, values, and role models provided in the educational encounter. The student acquires knowledge and subsequently is able to function in accordance with social survival parameters. Society in this way provides for the continuance and transmission of skills and modes of relationship particular to that culture.[2]

In the second case, cultivation of intellectual powers occurs with exposure to the subject areas comprising knowledge; disciplines are perceived as having constantly changing facts and processes but relatively stable guiding principles or laws (e.g.: gravity, entropy). This particular view of learning also regards character formation as occurring contingent to the process of exposure to knowledge.[3] (More knowledge = the more intelligent, wiser person.) Acculturation occurs as one internalizes certain principles and then applies them to other relevant situations in life and as knowledge strengthens one's action and promotes wisdom. According to the acculturative assumption, learning becomes a process of initiation, of access to the social treasurehouse of accumulated human knowledge and of the accepted world-views governing action and thought in that culture. Instruction, in both theories of learning, bridges the gap between learner and knowledge. The learner lacks until s/he receives knowledge.[4]

One can find fault in these educational assumptions about the purpose of knowledge to the extent one finds fault in the conditions of the institutions and societal relationships molding them. Social theorists like Ivan Illich contend that, in the process of education as socialization, the hidden curriculum contained in the setting and human relationships of the school restricts action and thought on the part of the students, overpowering those very thinking and creative behaviors that could foster social change in response to perceived injustices, inequities, and maladjustment occurring within the social realm. (e.g.: change in power structures, income distribution among the populace, class privileges, access to knowledge, etc.)

Illich insists that American culture in general regards learning as the sole province of an educational system through which all members of the society must proceed in order to attain knowledge. This is illustrated by enforced compulsory attendance laws. In effect, the educational system socializes everyone.[5] When knowledge is regarded as a process whose end is socialization, the educational dispensing agency -- i.e. the schools -- will begin to inculcate the population with the ways of perceiving and behaving in the world that are considered fitting for life and companionship with others in that society.

Illich, in his work Tools for Conviviality states that the major block to self-empowerment and involvement of people in their own learning involves the problem of re-definition:

> Not only has the re-definition of learning as schooling made schools seem necessary, it has also compounded the poverty of the unschooled with discrimination against the uneducated...once they accept the authority of other agencies to define for them their level of appropriate health or mobility. Just as they come to believe in the values of the 'knowledge stock' they acquired in school, so they come to believe that higher speeds save time and that income levels define well being or, as an alternative, that the production of more services rather than more goods increases the quality of life.
>
> The commodity called 'education' and the institution called 'school' make each other necessary. The circle can become broken only by the widely shared insight that the institution has come to define the purpose.[6]

Illich highlights the process of internalization of powerlessness encouraged in schools, suggesting that the first step toward assisting people in developing their own empowerment is to promote the awareness that schools and other institutions are defining the boundaries of their individual lives, when the individuals themselves should have the major voice in any social paramenter-setting. An institution such as education needs to engage in processes making in a "convivial tool" -- one that people, not unfeeling bureaucracies, manage for themselves.

The acculturative assumption about the nature and purpose of knowledge in our culture involves the valuing of knowledge as an indicator of personal success, worth, and character development. Samuel Bowles and Herbert Gintes in their work

Schooling in Capitalist America, designate this perspective as the technolo-meritocratic view, defining it as produced by a rationalization of unequal distribution of mental, physical, and other socially valued attributes among people. "The more successful are those who are more skillful or more intelligent."[7] Bowles and Gintes' economic analysis contends that schools are reflections of the economic sphere of our societal life and that education reinforces those forms of consciousness, interpersonal behavior and personality which foster, not individual growth, but effective participation in the labor force. Education creates reserve armies of skilled labor, legitimizes the techno-meritocratic perspective and in so doing stratifies people into status groups with differing power capacities in the society. Education serves as an acculturating force in that it accustoms and prepares youth to internally accept the social relations of dominance and subordinance they will encounter in the workplace.[8]

A study by Bowles and Gintes documents this charge; it shows a positive correspondence between traits emphasized as positive in the workplace with traits characteristics as punctuality, dependability, and the empathizing of orders. Notoriously missing were the self-directing traits of creativity, aggressiveness, and independence.[9] The fact that schools systematically de-emphasize the creative, intuitive learnings as part of their curriculum takes on added significance. Conformity, Bowles and Gintes charge, rather than individuality, is what is taught in the schools.

Bowles and Gintes illustrate that education "cultivates the development of certain potentialities and needs and discourages or penalizes others. It tailors self-concepts, goals, and group identifications within the individual class lines in order to match the economic needs of the culture."[10] If education then provides the skills, values, and means conducive to economic survival (socialization) it also prescribes the parameters which govern the individual's station (i.e., social class) in life through exposure to situations which foster the internalization of societal norms (acculturation). One's "choices" in life are moderated by the educational opportunities allowed considering one's sex, race, class, ethnic group, or age.

A.F. Schumacher adds another aspect to this argument when he insists that the advent of various technologies demands a shift in the structure and intent of our institutions. In his work Small is Beautiful he suggests de-centralized and manageable tools which individual people directly understand and operate as a starting point for societal change. He addresses his suggestions particularly to the field of economics. But, as economics and educational planning are so irretrievably linked, if one concurs with Bowles and Gintes, it follows that the "tooling down" of sociologi-

cal institutions as well as economic activities would be appropriate.

Schumacher sees education as a leading agent in the transition from "mega" to "manageable." He calls education "The Greatest Resource." Schumacher points to the highly scientific, rational guise knowledge has assumed in his culture, referring to know-how or use-value as being a "means without an end, a mere potentiality, an unfinished sentence." He asserts that education is more than mere knowledge of facts, than mere training; that it is rather a process of using ideas that make the world and one's own life more intelligible: "Intelligibility requires a sense of participation -- when knowledge is unintelligible one instead finds a sense of estrangement of alienation."[12] ...Education which fails to clarify our central convictions is mere training or indulgence. It is our central convictions that are in disorder, and as long as the present anti-metaphysical temper persists, the disorder will grow worse. Education, far from ranking as man's greatest resource will then be an agent of destruction."[13]

Schumacher also urges that education begin to reach more personally, more meaningfully into the depths of people's lives. Again the question of individual powerlessness emerges as a regressive offshoot of our cultural development which threatens to be extended by the growth of centralized technologies and large bureaucracies. There arises the need for the schools to perform a balancing function by re-defining learning in terms of promoting awareness of personal power within individual people. Knowledge comes to be recognized as a process of individuation when its purpose is just that.

A re-definition of knowledge offers an additional option to those formulations of knowledge which regard the learner as lacking until knowledge is handed down -- what Paolo Freire designates as the "banking concept" of education, wherein the teacher "deposits knowledge in the passive 'accounts' of student's minds."[14] Freire insists that knowledge is no different from the objects, personalities, relationships and additional factors operating in the learning environment.[15] He asserts that education should be a process of "dialoguing," a non-hierarchical process of exchange occurring among equal human beings. The process of mutual unveiling of assumptions which had previously defined one's action in the world, is called "co-intentional" education by Freire. Implicit in this definition is not only shared awareness, but commitment and involvement to act upon that awareness.[16]

Knowledge in such circumstances is seen in its proper perspective -- which is for people to know themselves and their world more fully. Zvi Lamm concurs, insisting "that

when education is not meaningful, it leads to the dehumanization of its possessor...the subjectivity of knowledge gives it its validity."[17]

To Freire the goal thus becomes the dialoguing and sharing of knowledge's content and means, so that individuals control it and avoid it controlling them. For truly egalitarian schools, it is necessary to achieve the voluntary establishment of members who freely identify with the goals of that organization. To accomplish this, students should be equal participants in the decision-making process which organizes the experiences and types of content so influential to the individual's development.

Admittedly, a personalized system of education would require more care attention and involvement on the parts of all people involved in the learning process. It would require more teachers, less "professionals" and more community members involved in the learning process. Knowledge is not meant to merely teach people how to most comfortably survive in the culture. Schools which provide for diversity and choice are necessary in a technological era where people either participate or acquiesce to institutional control of their lives.

A major source of difficulty in involving more people in the decision-making process seems to rest in the necessity for reconciling the needs for individuation and its attendent diversity with the pragmatic concerns of time, resources, and money. Even more of an obstacle exists, however, in the habit of thought which automatically labels plans for implementing these goals as unrealistic. It is such a one-dimensional view of perceiving that has already lead our society into the many blind alleys it faces today. Creative learning is needed now more than ever to envision alternative models of a "de-schooled" society which places the individual's growth ahead of an institution's efficiency in dispensing data bits.

If the aim of knowledge is socialization or acculturation, the differences in people are seen as obstacles to be overcome in order to include everyone in the common denominator given in society. Diversity is a basic premise defining humanity as individual human beings.[18] Although the concept of self-regulation may seem radical to educational thought at this point, it also seems a possible answer to the chronic boredom and lassitude students evidence in regards to learning. This occurs because most schools don't stimulate the individual's capacity for growth but rely on secondary motivations i.e.: achievement, social duty, monetary reward, security.

Illich charges that education is mystified and needs to become a convivial or personalized tool. Bowles and Gintes

assert that education serves economic, not individual's learning needs. Schumacher warns against dehumanization and alienation occurring as a result of technologies and bureaucracies over which people have no say, and Freire calls for an education that focuses on empowering people to control the circumstances of their lives. The process of individuation depends, it seems from these author's point of view, on breaking up the general social view of knowledge and regarding it instead of serving the single person. The role of the learning environment then becomes to assist the person in discovering and cultivating their own potentialities and power.

If acculturation is inevitable in any society the questions become: what kind of education? controlled by whom? for what purposes? In way of summary, the authors herein cited would probably have the following answers to these questions:

what kind?	a co-intentional, mutual dialoguing between teacher, student and community members; occurring in the direct context of the community; prioritized by the learner.
controlled by whom?	more parents and students involved in decision-making; less centralization of power in the hands of bureaucratic hierarchies and specialists.
for what purpose?	personal empowerment of the person who reciprocates by serving the society and the community. The sense of education as a means for self-aggrandizement is here supplanted by encouraging the individual to feel responsibility for the direction and content of social change.

All authors emphasize that individuals who are creative, questioning, and confident in their own abilities, not conformists, will best serve the positive development of society.

FOOTNOTES

1 Zvi Lamm, " The Status of Knowledge in the Radical Concept of Education," in Curriculum and the Cultural Revolution, ed. Purpel and Belanger. (New York: Mc Cutchan and Co., 1972), p. 127.

2 Ibid. p. 125.

3 Ibid. p. 127.

4 Paolo Freire, Pedagogy of the Oppressed. (New York: The Seabury Press, , 1970), p. 60.

5 Ivan Illich, Tools for Conviviality. (New York: Harper and Row, 1973), p.35.

6 Ibid. p. 20-21.

7 Samuel Bowles and Herbert Gintes, Schooling in Capitalist America, (New York : Basic Books, Inc., 1977), p.22.

8 Ibid. p. 56.

9 Ibid. p. 136.

10 Ibid. p. 129.

11 E.F. Schumacher, Small is Beautiful: Economics as if People Mattered (New York: Perrennial Library, Harper and Row, 1973), p. 82.

12 Ibid. p. 84.

13 Ibid. p. 101.

14 Freire, op.cit.p. 58.

15 Ibid. p. 31.

16 Ibid. p. 56.

17 Lamm. op. cit. p. 133.

18 Herbert Read. Art and Society. (London: Faber and Faber ,1945), pp.16-17.

Learning Tomorrows: The UMass Conference on the Future of Education

Robert Kahn

Although education remains an important vehicle for social change, it is currently stranded on four flat tires; things can't get much worse. That is about the only proposition on which 250 presenters and hundreds of participants might have agreed at a "Learning Tomorrows" conference sponsored by the University of Massachusetts School of Education last April, 1978.

Yet Learning Tomorrows glimpsed some brighter possibilities and "preferabilities." Speakers sought to encourage what one of its speakers, Kenneth Clark, called "a redefinition of the 'practical'." To some extent nearly all the participants, who included Buckminster Fuller, Ivan Illich, Jonathan Kozol, and Elise Boulding, did that while examining the damage wrought by contemporary "practicalities."

Ivan Illich, for example, offered an intriguing argument against formal language instruction. Consistent with his call for a "deschooled society," Illich argued that the expanding presence of formalized education is directly reflected in the "social disarray" of modern U.S. society. In particular, Illich decried the attempted replacement by educators of "vernacular language," which people spontaneously absorb from on another, with the "commodity" of school-produced "learned colloquial." This effort, argued Illich, contributes directly to "an individual's loss of subjective coherence. One turns to service to satisfy what he himself has been taught to need."

Elise Boulding, University of Colorado sociologist, echoed several of Illich's criticisms. She characterized education today as beset by "a loss of authenticity." Hazel Henderson, co-director of the Princeton Center for Alternative Futures, attacked contemporary education on similar grounds: "Schooling," she said, "is much like learning to ride a bicycle by reading about it, diagramming it on the blackboard, dissecting the bicycle--but never actually riding it."

Both speakers suggested future educational changes that would emphasize experiential learning. Boulding proposed that "the school become a place where teachers and learners of all ages are connected to one another and learn the skills that the community represents." Post-elementary education would be built entirely around apprenticeships.

Jonathan Kozol modeled his suggestions for educational reform on several of Cuba's current initiatives. After visiting and teaching in several Cuban schools, Kozol came away impressed with them as "workshops for real life: in the morning, the pen; in the afternoon, the plow." Ideology aside, the author of Death at an Early Age and the forthcoming Education for Liberation proposed the Cuban experiment as one way out of American schools' current "monopoly on the imagination of children."

The failure of U.S. education to bring the real world into the classroom was attacked by many Learning Tomorrows speakers. To some extent, each saw this shortcoming as central to the current dilemma in education today. Kenneth Clark suggested that the social homogeneity of U.S. schools belies the democratic principles the kids are supposed to be learning in government classes.

Harvey Scribner, UMass professor and former chancellor of New York City Schools, attacked the bureaucratic mentality of administrators. "It's easy to see we've spent billions of dollars on a system that isn't working. Yet we continue to write

prescriptions and smile."

Nat Hentoff, a veteran with Scribner of New York's school wars, placed a good deal of the blame on teachers. According to Hentoff, the tenure system releases teachers from any true accountability, a condition he characterized as "consumer fraud." The Village Voice reporter proposed "renewable tenure" as an equitable reform but acknowledged that "change will come slowly."

Apart from the speeches by many well-known educators, Learning Tomorrows offered scores of presentations by teachers, administrators, and students. Topics ranged from the esoteric ("Synergy: The Left Hand Meets the Right Hand in Education") to the practical ("Building Alternatives in an Established School System"). With an average of over six presentations every hour, the four-day conference suffered from a bad case of "information overload."

Nevertheless, the range of presentations and their generally high level of relevance was impressive. Conference Director Peter Wagschal, head of the School of Education's Future Studies Program, described Learning Tomorrows as an attempt to show that progressive change is still possible. "Our hope is that the conference helped educators see that the future can be designed and that we can't afford to wait for it to just happen."

The conference keynoter was renowned futurist, architect, and educator Buckminster Fuller. He sought to convey the urgency of educational change, saying, "The next several years will decide whether man will continue to inhabit this spaceship earth. The greatest educational challenge of all is to see that humanity comes to realize that it has the option to succeed."

Fuller cited the dangerous levels of nuclear armaments and the warfare mentality that are justified by the belief in fundamental scarcity. But he considers this conviction obsolete. "We know," Fuller argued, "that there is enough to go around. We must only apply our scientific knowledge to life-support needs. By doing more with less, we can provide for everyone and thereby eliminate the raison d'etre of war." Fuller claimed that this essential shift in priorities can only be brought about if education first helps institute a shift in values.

As Learning Tomorrows concluded, the gloomy consensus that education has bottomed out rebounded with a positive commitment for renewed effort. Mario Fantini, dean of the UMass School of Education, characterized the conference as a "dialogue which doesn't end here. . . . The challenges to American education demand more than criticism. Innovative action is needed soon." At the end of Fuller's talk Fantini offered this prediction: "After the frenetic activity of the sixties, the sobering up of the seventies, we'll have change coming in the eighties."

*This Article reprinted with permission. It first appeared in Phi Delta Kappan October, 1978

Smart Electronic Games and Video Games

David H. Ahl

In this year's crop of games you'll find more versatility, more choice, and more smarts for less money.

After the Toy Fair last February, it was obvious that the biggest growth category in the toys and games industry in 1978 would be in electronic and video games. Now that the prototypes that were shown last February are on the store shelves, it's time to do our annual round up of the new, the old, the good and the mediocre.

Many of the games below were reviewed in depth on our pages during 1977 and 1978. In those cases the issue and page number are noted at the end of the capsule description. Other games without an issue noted were tested only briefly for this round up.

In still other cases, we only saw the prototypes and can't vouch that the production models on store shelves will live up to the starry-eyed claims made last February at the Toy Fair or in June at the Consumer Electronics Show. These are identified by "NT" (Not Tested) following the name of the game.

No round up like this is ever complete. In some cases we deliberately left out a game (saying nothing at all was the nicest thing we could do with some new entries). In other cases, we just weren't aware that the product existed and/or information arrived after presstime.

In any event, shop around for variety and price. And try things out before you buy to make sure it will hold your interest or the interest of the person for whom it's a gift.

Manual Games

Zone X

Will Invicta ever give us a chance to recoupe (from Master Mind) before they bring out another challenging logic game? Zone X, their newest addition, is an interesting derivation of the Master Mind premise. The zonebreaker uses a pegboard to guess the target point set by the zonemaker on his marker grid. This is not an easy game!

Zone X, complete with searchboard, marker grid, pegs, marker, and eraser.

(A $25 bonus goes to the author of the best computer version of Zone X received by March 1, 1979 in addition to the normal game/article payment. Send listing, run, description and SASE. How about a graphics version for the Apple, TRS-80, or PET?)

Press Ups

Another Invicta game which we got in England some time ago but is finally available in the U.S., Press Ups is a fast-moving logic game. Each player has ten colored pegs, five at each side of the 7 x 7 board. Yellow pegs in the rest of the board are neutral. Players take turns pressing down one peg which must be adjacent to a previouly pressed peg trying, on each move, to guide the direction of play toward his colored pegs.

[Did you ever wonder who those exotic models are on the Invicta boxes? You guessed it — they're all Invicta employees in the various plants. — DHA]

(Yet another $25 bonus for the best computer version of Press Ups received by March 1, 1979!)

Super Master Mind

Super Master Mind is a step above Master Mind as it has 8 different colors (Master Mind has only 5). Speedy

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computer calculations indicate there are over 59,000 possible answer combinations (according to Invicta, I only came up with 40,320, but I was never much of a mathematician). To add to the challenge, leave an empty space in the "answer code" and watch what happens (you go bananas!).

Grand Master Mind

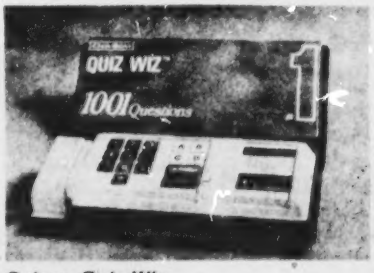
A game like Grand Master Mind is enough to make you swear off Master Mind games forever, or perhaps become permanently addicted. If you've played previous Master Mind games and thought them difficult, try this one. You are allowed 10 tries to guess the colors, and for a new twist, you also guess shapes. Master Mind aficionados will find this a welcomed addition to their collection.

Smart Electronic Games

Coleco Amaze-A-Tron

This clever little maze game may be played alone or with a partner. The computer gives a starting and finishing point on a 25-square grid. You move a plastic marker and try to find the correct path from start to finish. A short musical tune plays when you hit a correct square; a wrong move gets a "raspberry" sound. It takes a few plays to get the hang of it, but once you do, it's addictive. The tunes are pleasant and plenty loud to be heard in a noisy room of kids. "Solitaire Maze" is simple enough for a 6-year old, "Blind Alley — Back to Start" is a challenge to an adult.

Blue and white plastic case 4½ x 6¾ x 1½ in. Uses one 9-volt battery. Retail approx. $23.



Coleco Quiz Wiz

Quiz Wiz is a small electronic device which stores the answers to 1001 multiple choice questions. Armed with a booklet of 1001 questions (there are seven such books on subjects like sports, people, history, television, music and books, mathematics and trivia) you punch in the question number and your answer. Quiz Wiz gives you a green light and high tone if you're correct, a red light and low tone if you're not. We found the tones barely audible in a moderately noisy room so you have to watch the lights. To some adults it seemed like too much button pushing, but kids loved it. Ages 6 and up.

Maroon vinyl binder/case, 9½ x 4 x 1½ in. Uses one 9-volt battery. Retail approx. $20. Quiz booklets $3.

Coleco Digits

Yet another electronic Bagels/Master Mind similar to Milton-Bradley's Comp IV (except Digits only uses 4-digit mystery numbers). Two skill levels.

White plastic 6 x 4 x 1½ in. Uses one 9-volt battery. Retail approx. $18.

Milton Bradley Simon

Simon, a computer update of the age old game, Simon-Says, is, without a doubt, one of the best party games to hit the market this year. It is a large disc with four different color plates. Simon lights up the plates and you follow his lead by playing back the proper color and sound sequence. The music is loud enough to hear at parties and the lights bright enough for inside use. Three different solitaire and multi-player games and four skill levels make Simon suitable for Age 5 to adult. One possible drawback: the plates aren't bright enough for outside use or in the car (which would be a great way to keep the kids busy while driving on vacation.) However, this drawback is minor if you learn the music associated with each color.

White and colored plastic, 12 in. dia. Uses two D cells and one 9-volt battery. Retail approx. $25.

Dice.
No. 39R1861 Bone Dice. Square corners. No. 6, size, ⅝-inch.
Per dozen 9c
If by mail, postage extra, per dozen, 3 cents.

Milton Bradley Star Bird

When Star Bird first flew into the office, most females disliked the Star Wars-style craft, while the males praised it. Having had it in several different environments, this male/female reaction still seems consistant.

A microprocessor detects the attitude of the hand-held plastic plane (climbing, level, or diving) and simulates appropriate engine speeds. It also "fires" lasers with a "realistic" zap sound accompanied by blinking lights.

Various parts detach (escape pods, interceptors, high-speed fighter) and could break in impatient hands, although it is as rugged as any other plastic toy. The Raggedy Ann/Andy school of "kids-make-their-own-fantasy" school of purists won't like Star Bird; most kids (and their fathers) will love it.

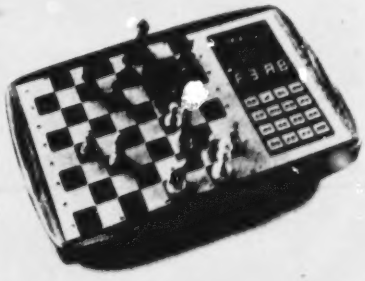
Gray plastic with colorful markings, 15 in. long. Uses one 9-volt battery. Retail approx. $15 to $20.

Boris

In this electronic chess game, the amount of time the computer has to process its possible moves is set by the player. Up to 100 hours can be allowed but several seconds is enough to give a challenging game. The pieces, small board, and computer with keyboard and LED readout fit in a walnut box with lid. Boris comments on players' moves via phrases traveling across the LED display. **Boris Master** operates on rechargable batteries and has a memory feature. Suggested retail prices: Boris $299, Boris Master $399. **Boris** is distributed by Chafitz, Inc., 1055 First Street, Rockville, Maryland, 20850.

Chess Challenger X

This is the latest computerized chess game of Fidelity Electronics. The X means ten levels of play where one level roughly corresponds to the microcomputer looking ahead one-half move. Level one requires a few seconds, while level ten requires around several hours for a move. The board is part of the unit while the LED displays and touch pad keyboard are on the side. Features include a beep when its move is complete, and a random choice between moves that are judged to be nearly equal in value. Suggested retail price is $275.



TI Speak & Spell

Electronic voice pronounces over 200 words, you key in the spelling. It announces when you are right or wrong and displays your score. Games like "Mystery Word" and "Secret Code" add to the fun of learning to spell.

Red plastic, 6½ x 10 x 1½. Uses 4 C-cells. $50. (Sept./Oct. '78, pp 60-61).

TI Spelling Bee

Non-speaking version of Speak & Spell. Comes complete with picture book and fold-up case. Uses 9-volt battery. $30. (Sept./Oct. '78, pp 60-61).

Arithmetic Practice Calculators

Seven of these little calculators are on the market this year, some with built-in games (Dataman), some which keep track of number correct and also display correct answers (Little Professor, Quiz Kid II), and others that only light up a green or red LED in the case of a correct or incorrect answer. All use one 9-volt battery. Prices from $8 to $25.

Mattel Auto Race, Football, Missile Attack

In all three games you control a bright light blip which represents your car, player or missile. Computer controlled blips are coming toward you (or you are moving toward them) and you are trying to avoid a collision (in Auto Race) or being tackled (in Football), or you are trying to shoot down enemy missiles. We liked Football best and Missile Attack least. For 1978, Missile Attack has been renamed "Battlestar Galactica Space Alert" perhaps hoping that the new TV show will stimulate sales. Also "Basketball" has been added to the lineup but we've not had a chance to try it.

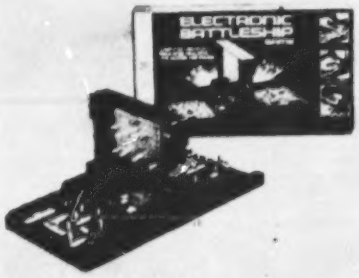
All come in a handheld plastic case and use one 9-volt battery. Retail range $18-$35. (Jan./Feb. '78, pp 27-29).

Milton Bradley Comp IV

Use the calculator pad to guess a secret 3, 4, or 5-digit number. Comp IV gives you clues (how many digits correct and how many in the correct

position). A game with lasting interest.

Plastic console 7½ x 4 x 4 in. Uses one 9-volt battery. Retail range $20 to $40. (Nov./Dec. '77, pp 36-37).

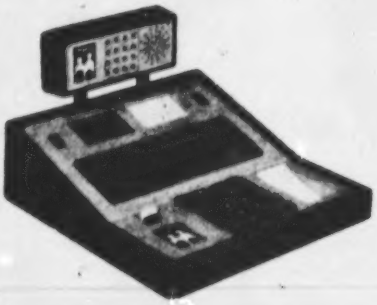


Milton Bradley Electronic Battleship

An electronic version of the manual Battleship game. The electronics mainly provide zippy sound effects. Retail range $30-$50. (May/June '78, pp 47-48).

APF Mathemagician

A teaching calculator which can be "programmed" to provide arithmetic problems on almost any level of difficulty. Mathemagician also has six built-in games which can be played using different plastic overlays. The large size and bright display make it ideal for younger children. Uses 6 C-cells. Retail $39.95. (Mar./Apr. '78, pp 92-94).



T.E.A.M.M.A.T.E. Game Computer

This device is a battery-operated device with a microprocessor, limited memory, 4 x 4 lamp display, 16 key keyboard, and speaker. It comes complete with 25 simple programs in memory which can be "called" by pressing the appropriate keys on the keyboard. Each program is described in the very complete manual. The "programs" are in a low-level logic rather different than either Basic or machine language. The output is all through the 4 x 4 lamp display which uses a different slide overlay for each one. Blank overlays are also included so you can write your own.

The second chapter (12 pages) of the manual is an introduction to binary and hexadecimal number systems, computer organization, and elements of a large-scale computer system.

Uses 4 D batteries (which we found should be akaline or extra duty). From Logix Enterprises. Retail $40-$50.

Parker Brothers P.E.G.S.

15 chase and maze games played by inserting pegs into a double-sided electronic board. Makes sound when two pegs are in the same hole on opposite sides of the grid. Sounds innocent enough but once you start playing it begins to get wild! Although aimed at children from 7 to 14, adults had a ball playing "Battle of the Blobs", and "Hostage." Plastic. Uses one 9-volt battery. $15.

Parker Brothers Merlin

Plays 6 games (Tic Tac Toe, Music Machine, Echo, Magic Square, Mindbender, Blackjack 13) with 9 levels of difficulty. We enjoyed "Echo" immensely, trying to echo Merlin's tunes — no one here could echo more than 7 notes correctly. "Magic Square" was quite a challenge also, particularly the "challenge version for experts only." Eleven touch keys; red plastic. Uses 6 AA batteries. $25.

Invicta Electronic Mastermind (NT)

Break the hidden 3, 4, or 5 digit code in this electronic version of Mastermind. LED display tells how many digits are correct and in right position. Handheld. Uses 2 AA batteries. $20.

Video Games

Bally Professional Arcade

Outstanding graphics, 256 colors, nifty 3-function controllers and a nice assortment of game cartridges make this a system well worth considering as a video game system. However, for an extra $50 Bally offers a programming package that includes a Basic cartridge and an excellent printed introduction to the language that does not presume any previous computer experience. The Audio Cassette interface for another $50 allows you to use a standard cassette recorder to save and retrive programs. The ease of using the color, graphics and music (built-in 3-octave music synthesizer) is remarkable, though you probably won't be able to match the complexity of professionally prepared programs. $299. (Sep./Oct. '78, pp 56-59).

Atari Video Pinball

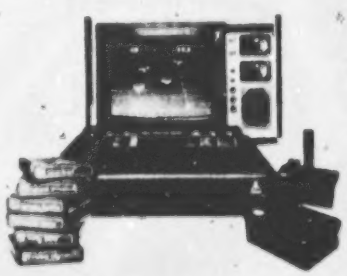
Plays four pinball-type games, two with flippers and two with a moving paddle at the bottom of the screen.

Also two basketball-type games and the incredibly popular Breakout in which you move your paddle to hit a ball to break away six colored walls of bricks at the top of the screen. Fun for the beginner, challenging for the expert. Extremely addictive. Uses 6 C-cells or AC adapter. Retail $55-$75. (Jul./Aug. '78, pp 35-36).

Atari Video Computer System

Perhaps the most comprehensive programmable game playing video system around, this unit has two skill levels, four types of controllers and an enormous library of games. Twenty game cartridges are currently available including Breakout, Indy 500, Blackjack, Starship (maneuver through space), Surround (lay down a maze with an opponent without getting trapped), Air/Sea Battle (planes dropping bomps, submarines launching missiles, shooting gallery), Outlaw, Home Run, Slot Racers, and, of course, Video Olympics (50 Pong-type games and variations). Most cartridges contain 3 to 6 fundamentally different games and 6 to 8 variations of each one.

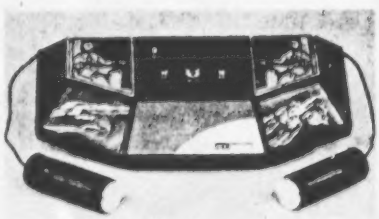
Retail $165-$200. Cartridges $19 each. (Jul./Aug. '78, pp 37-39).



Fairchild Channel F System II (NT)

A redesigned version of the original Channel F, this has four difficulty levels, four time limits, and a unique "freeze" switch which permits interruption of a game with play resumed later (nice if you want to watch TV and play during commercials — or vice-versa). The unique controllers, which we found a bit difficult to get used to, turn, twist, push and pull in eight different ways. Three game cartridges use a numeric keypad controller (Poker, Football and a lunar lander game). Twenty-one other cartridges are availale over a wide range of subjects, some with as many as 284 variations.

Retail $125-$150. Cartridges $20 each.



APF Model 500 (NT)

A dedicated video unit with 20 space games including Space War," Space Phasor, Phantom War (invisible space ships) and more. Guided or direct missiles.

Video Sport, TCR-900 PC (NT)

Yet another entry in the programmable price race ($69). This, like the last three products, will probably appear under various private label and store brand names.

Radofin Telesports III (NT)

A Hong Kong entry, Telesports is a low-price ($69 retail) programmable. Comes with 2 joysticks. Seven game cartridges planned with up to 10 games each.

Otron Gamatic 8600 (NT)

Another low price ($69) programmable with two joysticks. Four cartridges as of August. From Korea.

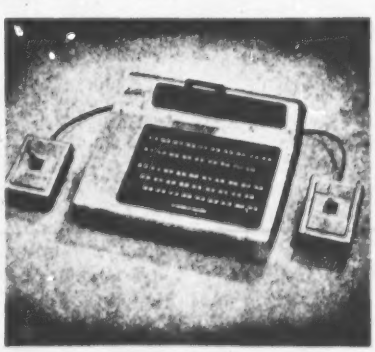
Video Technology Model 501 and Model 2003 (NT)

Two programmable entries in the low price derby (below $70). The 501 is a basic programmable while the 2003 has extended capabilities similar to Video Brain and also high resolution (256 x 256 pixels).

Coleco Telstar Arcade

Of the programmable video games, this is certainly the most tactile. No little knob to steer your racer, but a good size steering wheel and gear shift. And for the target games, a full-size (plastic) pistol. Two remote controls included in the price of the sports cartridge supplement the two built-in ones and allow for four-player competition. Two-level skill control.

Triangular plastic housing approx. 15" on a side. Comes with AC adapter. Bargain priced at $65; cartridges $10 to $15.



Magnavox Odyssey (NT)

Video system featuring a touch-sensitive alphanumeric keyboard as well as the usual joysticks. The keyboard and "computer introduction" cartridge indicate that Magnavox is looking ahead toward a truly programmable computer on the order of the Bally Arcade; but this is still only a game system. Around $180. ■

A Synthesis of Perceptions
on
Learning, Maturing, and Purpose

by

Jo Ann A. Mahoney

The current crises of poor achievement scores, violence, vandalism, and personal destructiveness in education and society reflects the demise of an education system which is ineffective in meeting the needs of people growing and changing in a globally interdependent world. Because it is a system lacking intrinsic purpose and direction, it must be maintained largely by external means.

Orientated around subject matter which must be taught, schedules and rules which must be followed, with external rewards and controls in the form of teachers and administration ensuring that requirements are met, in large measure, it is a system which controls mind and behavior, denies the soul and emotion, and breaks the spirit.

This essay presents a more purposeful approach: one which strengthens responsible autonomy of mind and behavior, and emphasizes a humane and purposeful committment to perpetuating life. Initially, it is appropriate to examine two important issues facing educators today: 1) effective discipline, and 2) academic achievement.

Discipline difficulties consistently head Gallup polls regarding educational concerns. Perhaps inherent in the essential characteristics of a discipline problem is the direction to be followed in realizing its solution. A discipline problem can be described as disrespect for a person or person's possessions, or as behavior that assaults one's humanness. In essence, it is a lack of internalized human responsibility for one's behavior as it affects others' rights.

Since most schools depend on external measures to control human behavior, when numbers of students increase (as in our inner cities or in schools with large populations) that kind of control breaks down. Young people come to learn very well that only external controls have validity: push drugs, but don't get caught; do the work, and get a grade. Once constraints are no longer bonded to a purposefulness in human endeavors, these external controls break down.

As a result, it is not inconsistent that young people come to act like inhuman savages who vandalize, molest, and murder. The internalized guides and restraints which develop when human ramifications of human behaviors are experienced and examined, have never been strengthened. The human being is seen as an exploitive controllable object.

In a related vein, because of its pervasiveness and accessibility, the use of the media is highly influential as a tool to enhance or inhibit learning. The potential to inhibit learning exists in the blunting of internalized responses to a presented situation. The repercussions of a violent act, a death, or an idea cannot really be experienced as the scene

changes quickly or a commercial flips away personal human involvement with the situation. Thus, on a regular basis, one comes to see acts severed from their human impact and ramifications.

In addition, television and the cinema present graphic and aural representations of life. They are not, in fact, 'life'. Yet, their graphic and aural semblance to life eases an uncritical acceptance of them as reality. This superficial experiencing further short-circuits the internalizing essential in any learning.

A second issue facing education and society today is the quality of student achievement. Approaches in curriculum, techniques, and processess which promote administrative and teacher accountability and effectiveness are pervasively sought and implemented. Again, the nature of the solutions selected largely deal with strengthening the effect of the system and its agents (teachers and administrators), and their effect on the learner. The educational concerns thus center around the external efforts to and on and for the student, rather than what is or is not going on within the student--the internalizing dynamics called learning.

Therefore, approaches to effective achievement and discipline must come to recognize the human investment in learning.

An intriguing characteristic of the human mind is its capacity to shut down, tune out, turn off, especially when there is an overload of external stimulation and/or interference from strong internal stimuli. It usually employs this capacity when not actively and authentically involved in meaningful purpose. What may begin as a defense, progresses to a habit, to a coping style, and eventually can result in a kind of anomie, such as that which characterizes "mindless acts of violence."

The constant barrage of external visual/visceral/aural stimuli, so much a part of our daily living, denies a person opportunities of internalizing, conceptualizing, concentrating, thinking, discerning, questioning, reflecting, aspiring, etc., crucial to effective learning, healthy living and creative responses to life.

Two salient effects on youth become apparent. One is their complaint of being bored, when they may mean external stimuli are not effecting them internally. A second, compounded by negative internal stimuli, such as anger and frustration, is a sense of inadequacy in coping with living. Thus they seek their adjustments, their escapes, their highs in other ways: drugs, alcohol, prostitution, teenage pregnancies, etc. Without the impact of positive intervention, profound despair, suicide and impersonalized assaults escalate--as they are doing today.

Youth become ripe targets for pimps, pushers, media hucksters, religious cults, etc. They promote the internal stimulus young people crave; they tap into the negative feelings which the young exude. They delude youth with promises of instant adequacy. These young people come to our schools.

The response to public and professional pressure to bring about more accountability in teaching and effectively discipline the negative

behavior of many of our young, appear short-sighted in addressing learning needs. In addition, they serve to perpetuate solutions which strengthen the external control of the system. Several salient solutions are briefly delineated in this article.

For a good many administrators, MBO (Management by Behavioral Objectives) has become dominant in their administrative policy. Education borrowed a fragmented aspect of the business model, and externally applied that fragment (MBO) to a 'product' (the human being) whose quality control one can't quality control. Many are assuming education based on behavioral objectives will diminish educational ills. MBO has important, but limited value in effective education, in that it requires a system to closely examine what instructional material is being taught and to what degree the skills have been learned. Soon many may come to respond, as a highly progressive superintendent recently confided, that there are too many human variables to assume MBO will effect the kind of learning so necessary.

In addition, while many state evaluation laws provide for a well-balanced accountability in 'education', public pressure is on that which is 'observable' and externally measureable. Especially at a time when jobs are few, teachers and administrators are likely to expend their efforts and energies in this area--quite possibly at the expense of a balanced focus.

The 'back-to-basics' movement is an example. This author does not dispute the importance of competent skillfulness. What appears clear, however, is that the amount of energy, money, and time that is to be exerted to ensure that this goal is achieved might better be employed by examining skillfulness in the context of a larger purposeful whole of 'education,' for then the learning will be successful.

Solutions responding to discipline difficulties, assaults, and vandalism in educational institutions have largely taken the form of arrests, guard patrols, police protection, gated doors and windows, and computerized security systems. These provide visible examples of the extent to which external controls must be used to enforce an ineffective system.

Stronger parental involvement in the planning and decisions of their children's education, is advocated as a solution. Clearly, it is their right since they bear the costs of education. Their children's improvement is important to most-many do not care at all. Many young people bring problems to school which are the direct result of the quality of parental care. Some have parents who work too hard and too long to have energy and time left to work with their child's school; some won't; some children don't have parents. Some young people run away from home, defy parental influence, or lead 'secret' lives.

Any productive involvement of parents is valuable, dignifying, and important. In addition, it is crucial to focus our thinking, energies, and resources to a strengthening of purposefulness in the young themselves.

The costs of 'education' have become critical and decisive factors in school districts. Many respond by reducing force: eliminating professional positions, programs, or higher salaried personnel. Aside from the professional and financial effects on the personnel involved, which are important and substantial in and of themselves, translates into young people being denied opportunities to enhance their growth and learning.

Increasingly, school districts are becoming incapable of sustaining the costs of education and the taxpayers won't or can't. Many close their doors part-way into the school year.

In addition, to ensure these measures work, considerable amounts of administrative and teaching energy in planning, implementation, paperwork, etc. must be expended at a time when the human and academic demands of students are compounding.

Administrators and teachers only have so much human energy to go around. In to many instances, they are frantically pursuing the accomplishment of unaccomplishable goals under the heat of public pressure and power groups to maintain a system which helps to create and compound its own difficulties.

In to many instances, it seems the young are in the way of the smooth running of the school. Too often, one witnesses young people turned away from receiving a teacher's instructional or personal attention so that teacher could tend to the paperwork required of the job. Too often we know of administrators who bury themselves behind closed doors for the much needed respite from continual crisis intervention. Too many times we see report cards of all "F's", young people impervious to the effects of personal injury they inflict, or druggedly sitting in the class where the teacher is supposed to pretend nothing is wrong.

This negative stress takes its toll on everyone involved. Administrators and teachers have less time and energy to be effective. Many are succumbing to these stresses by resigning, adhering without question to policies detrimental to a student's good, malingering, taking frequent mental health days to re-charge energies, watering down curricula and/or acquiescing to threatening students.

This synopsis is not to suggest that efforts and procedures which work to bring responsibleness in these endeavors should be abandoned. What is being suggested is that what must be clearly examined is the targeted direction of these efforts in effecting learning and responsible behavior.

To achieve these goals, recognition and sanction must be given to the important interrelatedness of human dynamics in the internalizing process of learning, and the importance of authentic personal proposefulness.

> *There is no more important and substantial purpose than the developing of oneself to assume a responsible role in future global human perpetuation.*

A brief consideration of the components of this last statement is of value. "There is no more important and substantial purpose..." A premise central to this essay is that purposefulness is essential in learning... "than the developing of self... "Learning is authentic and personal. Is there anything more personal than one's learning about one's self; mind, body, soul, and emotion. "...to assume a responsible role..." Responsibility involves active human commitment. It is essential in addressing future and global issues "...in future..." Anticipating, conceptualizing, and planning for that which is yet to be, emphasizes the constructive and positive in human endeavoring. "...global..." Understanding the interconnectedness and interdependance of all resources, life, knowledge, and decisions, integrates one's self to all. "...perpetuation..." The re-creative linking of life through itself, enables the efforts of each human being.

Learning about oneself with and through others, a conscious understanding of the interconnectedness of all life, and the active investment of oneself in conceptualizing, planning, and actualizing humane futures, internalizes and strengthens responsibility to the re-creation of life.

Thus, the perspective embodies both a purpose and a learning process—a synchrony of goal and methods. As a purpose, it is the development of people authentic and responsible to themselves and life, strong in spirit and will and skill. As a process, it is the synergizing of all learning with and for life.

The progression of a person through a life span of time is termed aging. Human development that is the integrative growth of mind, body, soul, and emotion with and for others, can be considered maturing and becomes crucially important in decisions effecting future human survival.

The length and scope of this essay preclude expansion on the implications and applications of this perspective as they relate to the immediate issues surrounding schooling, discipline, and achievement. The perspective presents a purposefulness in learning efforts. It presents a synthesis of perceptions for consideration in examining a purpose and process for learning appropriate to rapid societal changes and technological advancements such as we are experiencing.

Group Grading as a Means of Teaching Cooperation

Peter H. Wagschal

One of the most consistently mentioned characteristics of life in the future is that it will require considerably more cooperation, and much less individual competition, than we see in the present. The problem with such claims is that, for people as oriented toward individuality as we are, the very notion of "cooperation" is too abstract to have much power in helping us to shape our future. The following arrangement, one which I have used frequently in my classes, is designed to give students a first-hand experience with the need to cooperate so that the notion will be removed from the realm of abstraction and, thus, made more real for them.

The day-to-day activities of the class, and the homework assignments, may be conducted however the teacher wishes. What changed is simply the basis on which all graded work is assessed. For each graded assignment, then the rule is that if one student in the class fails that assignment, then all of the members of the class fail it as well. Each assignment, whether it be a test or a written paper or a project, is carried out and graded individually, but the class is forced to make sure that students who need help get it, for they are in a situation where one person's failure affects them all. In addition, students must work together, discuss course material, and assess each others' performance throughout the course.

The structure of the course itself will, under these circumstances, inevitably become part of the content, as students and teacher find themselves thinking, feeling, and talking about what happens when people are forced by circumstances external to themselves to cooperate with one another. Since those are precisely the conditions that many futurists are suggesting will be an inevitable part of our futures, the structuring of a classroom experience in such a manner could go a long way toward "making future possibilities more real for others," the ingredient we consider to be essential to a successful future studies program.

ANSWERS TO COMPUTER LITERACY QUIZ

1. F	7. F	13. 4	19. F	25. F
2. F	8. F	14. T	20. T	26. T
3. 1	9. T	15. T	21. F	27. T
4. T	10. 1	16. 2	22. F	28. 4
5. 5	11. T	17. 3	23. F	29. 4
6. 2	12. 3	18. T	24. 4	30. F

THE NEED FOR ALTERNATIVE DECISIONAL AND PROBLEM SOLVING APPROACHES IN FUTURE STUDIES CURRICULUM

Thomas D. Osborn

Most future studies are concerned with specific aspects of future possibilities. They are usually technologically oriented (i.e., concerned with questions of pollution, energy, transportation, population, etc.) and situational in approach. These are vitally important facets of future studies as they alert society to potential problems and dangers and alert individuals to the fact that there are always many alternatives to every solution.

One facet of future studies which has not received great popularization is the question of how future decisions will be made and who will make them. Shall we continue with decision making by fiat, leaving choices to technocrats and planners, or politicians and bureaucrats, or big business and the ultra-rich? There is a growing feeling from significant segments of your society, including many from the groupings above, that decision making by "expert" has not worked very well and what is needed is to step toward the ideal of truly democratic decision making.

I would like, in this article, to discuss the need for exposing our young people, our future decision makers, to a process and an "attitude" which will: 1) enable them and society to more effectively identify, select and implement the best of many possible futures, and 2) provide them with vocational skills (i.e., democratic decisional skills to fit a new and rapidly growing need of the business world). This is intended as the first of several articles with subsequent articles hopefully being more pragmatic. In the spring issue of the FII, 1979, I will discuss the most basic and least understood tool of democratic decision making, goal setting and evaluation, along with some ways in which it can be utilized by individuals and groups in the classroom and school.

In light of current social, economic, ecological and energy crises, it is clear that our decisions regarding selection of alternatives and their methods of implementation have neither been appropriate nor adept. When decisions consistently produce unsatisfactory results it would be logical to examine the way decisions have been, and still are being made, what is most obvious is that decisions are not <u>made</u> - they <u>happen</u>. Technology dictates it's own application. Special interests dictate courses of action which heedlessly affect entire populations. Deliberate refusal to acknowledge problems leads to "crisis" situations which dictate expedient solutions with disastrous long term effects. Even our most democratic decision making event, national elections, applies only to the selection of a very small portion of those few individuals who actually make major decisions.

Most Americans will disagree, verbally, with this argument but support it with their actions. In the last election only 54% of the eligible population chose to vote. If you are disillusioned with your decision makers, you vote the rascals out. If you are disillusioned with the decision making process, you drop out. The result is a system which allows only a minimal amount of participation to all but a minimum, select group. This restricts the pool of perspectives, ideas, opinions and alternatives available which in turn results in partial or expedient decisions with inefficient and/or hazardous consequences.

This is at least partially a result of the size of our major institutions, but is primarily due to our inability to develop and utilize truly broad based democratic decision making processes. In truth, most of our training, education and socializing experiences are oriented toward conditioning to accept authority, rather than enabling us to participate responsibly in decision making.

In past ages this was not a particularly dangerous situation. The pace and scope of technological advancement was slower and affected a much more limited population and geographic area. This allowed corrective action, or inaction to occur before the trauma became too extensive.

Since World War I this situation has drastically changed. The pace and scope of technological progress has been such that a phenomenon has evolved which is self-agitating, self-imolating and chaotic in the sense that change creates change in a way and at a rate to which our traditional managerial systems have proven unable to adapt. It can be said that since World War II, we have been living in an environment of social, economic and technological turbulence; like running blindly down a mountain side on the very front edge of an avalanche created by our running blindly down the moutain side.

Around the beginning of this century our organizational and decisional systems reflected Taylor's theory of economic engineering (i.e., highly differentiated, mechanical application of preferred individual functions). This has been manifest in rigidly hierarchical, minutely segregated organizational structures and decision making processes in business, government and throughout society. Assembly lines and rigid bureaucracies are prime examples of this form of structuring.

In the forties a number of large corporations began to identify certain inadequacies in Taylorism - primarily its' inability to manage the very turbulence it had helped create. Institutions such as Exxon, General Mills, General Electric, IBM, Union Carbide, TRW Systems, Armour, Bank of America, John Hancock, Digital, Polaroid and General Motors have since attempted to develop and implement organizational systems based on principles such as multi-task autonomous work groups, shared and participant decision making, worker self-management, and less authoritarian managerial modes - concepts which foster the kinds of flexibility, responsiveness and on-the-spot decisional capability which can enable an organization to respond quickly and appropriately to turbulent change.

Whether labeled Worker Self-Management, Organizational or Industrial Democracy, Participant Control or Quality of Working Life, these programs have consistently demonstrated improved internal functioning, more efficient decision making, long term effective problem solving and quite often, an improved productivity/profit picture. While there are elements which can bring about the failure of such a project, one factor which appears consistently in case after case is the inability of key personnel to understand or utilize certain basic decisional and/or group process skills. Workers and management, in many cases, evidenced a lack of training and experience in what were assumed to be "common knowledge." Although training programs were often used to provide these skills and experiences they were not always successful. It is more difficult for me, as a middle-aged manager, to unlearn and relearn long entrenched beliefs and skills than it is for a teenage student to learn the same things as basic knowledge.

Educators usually agree that the primary purpose of our educational system is to prepare young people to be constructive, responsible members of society. It is also seen that one of the most important aspects of that education is preparation for entering the world of work. This usually consists of instilling work skills in response to needs expressed by business, skills such as verbal literacy, computation, entry level vocational specialization, ability to accept authority and willingness to conform. This, however, is a response system which forces educators to provide yesterdays skills to young people entering tomorrows world, a world in which the only constant is turbulent change.

As educators concerned with bringing future studies into the classroom we have a unique opportunity to effect change on this after-the-fact response syndrome. There are three areas of interaction in which the teaching and the experiencing of these concepts can be implemented. In actuality these areas are highly interdependent and over-lapping; in an ideal situation implementation will be on all three levels. Implementation, however, can begin at any one of the three levels.

1. We can expand our future studies curriculum of planning methodologies, ecology, energy, futures technology, etc. and include units on principles of problem solving, decision making techniques, goal setting, evaluation methodologies and group process skills.

2. We can structure the learning process and activities in such a way that we encourage and enable: a) student self-management, b) participant controlled multi-task groups, c) goal setting and mutual feedback and evaluation, and d) individual and group decisional experiences. These should be presented in a structured, supportive format of well defined but real situations with progressively more real/serious consequences and increasing degrees of responsibility.

3. We can work towards the restructuring of our educational institutions so that individual and group participation in decision making processes are integral to every element of the institution and that the overall environment is one in which failure is not seen as terminal; success is rewarded with opportunity for greater challenge and increased responsibility, and the thrust is to empower students to gain responsible control over their own lives and the institutions affecting them.

This is not just nice, interesting but impractical philosophical theorizing. There is a real, immediate need for these skills and attitudes. We have only to look at the apathy or outright hostility people demonstrate toward our current political process or talk with businesses trying to move into the future with people trained in the past. The possibility of implementation is also not just theory. The possibility of implementation is also not just theory. There have been curricula, methodologies, activities and entire schools structured around these concepts. The rewards are also clear and immediate.

We should not expect that the implementation of these ideas will be simple, easy or painless. Staff at schools that have had success have found they are no more skilled, knowledgeable or experienced in group process and self-management than their counterparts in business. Nor are our educational institutions any more capable of easily internalizing these concepts than a traditional corporation. What they have found, however, is that in addition to the professional satisfaction of providing better life preparation for their students, comes the purely selfish benefits of advancement of their own personal skills, and a marked improvement in their working environment and increased support from business and their community.

If we are concerned enough about the future and exposing young people to it's possibilities, problems and alternatives, then we must expose them to the "futuristic" skills needed to participate competently and responsibly in making effective decisions about their future including how to successfully survive in an increasingly complex and turbulent world.

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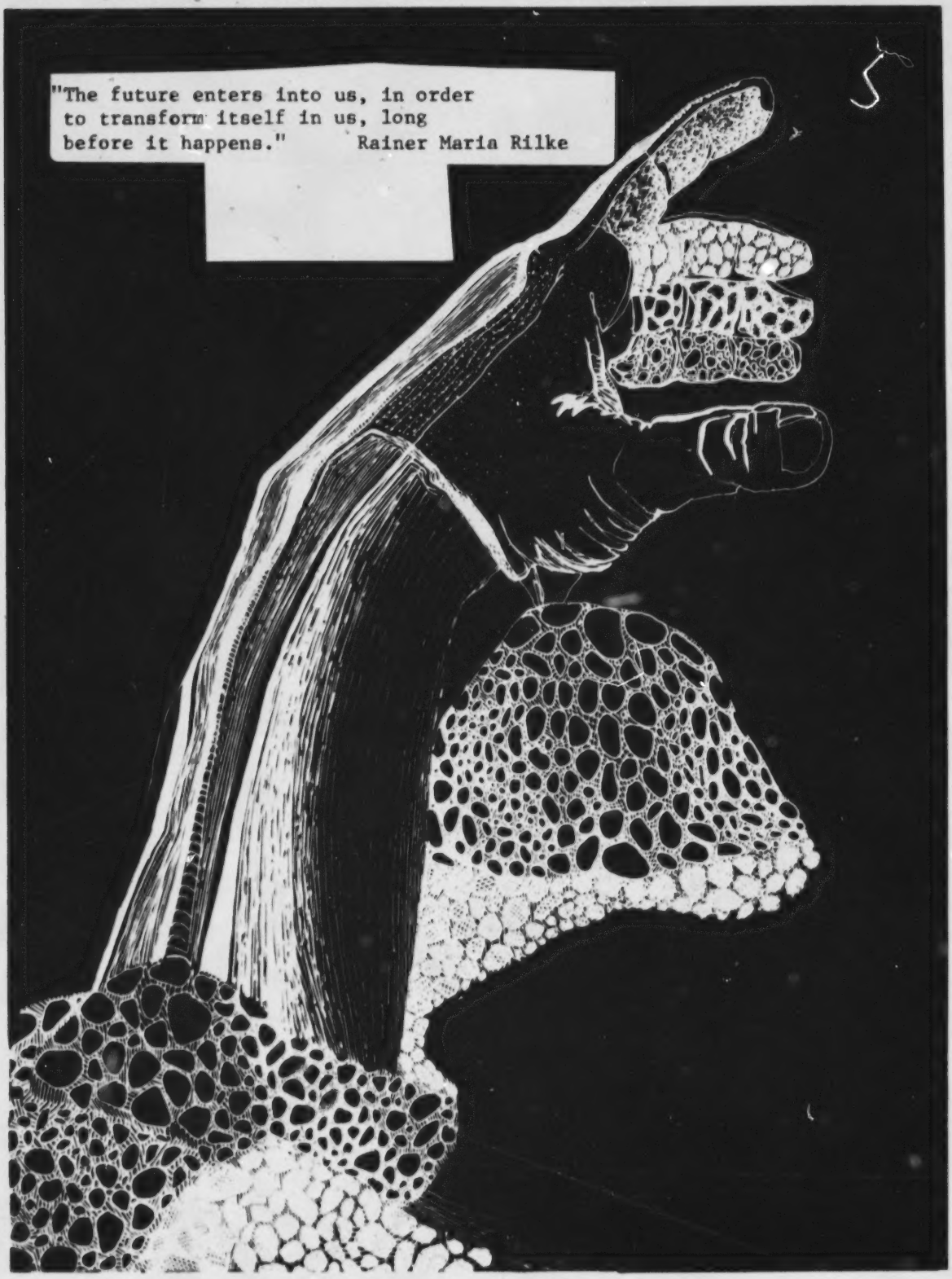

F.I.I.

Volume VI, Number 2

ARTICLES

3 Toward a Redefinition of American Education
by Mario Fantini

7 R. Buckminster Fuller: A Synergetic Approach to Education
by Peter Wagschal

11 A Language Arts Teacher Meets the Computer--Tentatively
by Denise Holmes

13 Exploring Some Basics of Technology Literacy
by Peter Wagschal and Robert Kahn

16 Through the Briar Patch of Educational Futurism
by Stephen Anzalone

19 Education, Societal Learning and the Future
by John McClellan

FUTURES LEARNING ACTIVITIES

22 Museums as an Educational Resource
by Cathy Horvitz

24 Images of the Future
by James Masker

RESEARCH IN EDUCATIONAL FUTURISM

28 Brainstorming as a Divergent Thinking Activity
by Neal Norris

31 Factors Influencing Art in Capitalistic Society
by Kathleen Chatwood

BOOK REVIEW

35 Review of Harold G. Shane, Curriculum Change Toward the 21st Century
by Dennis Livingston

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Towards a Redefinition of American Education

by Mario Fantini

This noted educator holds that: "A comprehensive educational system is required to replace the comprehensive school system which has been created and which is rooted to the needs of the past. We need a structure capable of coping with the future."

American education is proceeding through one of its most important historical periods. As we close in on the next century, the forces that have transformed our society from a stable agrarian culture to an industrial one have also started us on the road to a redefinition of the form and function of our public schools.

Since their inception during the colonial period, public schools have attempted to respond to the needs and demands of the community that they serve. Thus, at the time of the Massachusetts Bay Colony, schools were instituted to provide a more responsive way of teaching the next generation to read so that they would possess the basic skills necessary for reading the Bible, thereby thwarting that "Olde Deluder Satan" who was contaminating the hearts and minds of the young. With the influx of immigrants to this country in the late nineteenth century, it became necessary for schools to expand their curricula to provide basic literacy and civic orientation to the new would-be citizens. Later, as the manpower necessities of society changed, the schools responded by establishing vocational education. As we became increasingly automotive, the schools responded with driver education. When the Russians launched the first Sputnik, the focus of America's response was once again on the schools, insisting this time on more contemporary approaches to science and mathematics. When society declared war on poverty, the schools became a front line. As our national leaders fell victim to ethical erosion, the schools were asked to emphasize moral development. And so, the interface between the needs and concerns of society and the schools continues. The schools remain the one institution, strategically placed, which has the capacity to influence future generations.

However, the requirements of a post-industrial, twenty-first century America are of such a qualitatively different order that the structure of public schools that has evolved thus far can no longer respond adequately, necessitating a redefinition in function and form.

In brief, as society has changed, so have the needs of its people. As in the past, we are all witnessing the profound social revolution surrounding us--international interaction, interdependence, conservation and conversion of sources of energy, global population explosions, speed-based transportation and communication systems, shifts in life styles and tastes, consumer awareness, scientific and technological advances, cultural pluralism, human rights, and so on. These revolutions have placed enormous continuing stress on the schools. In turn, these dynamics

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have affected the aspirations of the people who are trying to adapt to these profound alterations in their lives. Invariably, and as they often have in the past, the people as consumers and their elected officials as policy makers look to the schools for assistance. Only now, it seems the schools cannot keep pace. Why? What sort of societal necessities and demands are converging on the schools? Why are schools now not able to respond as they had in the past? Will the schools somehow be able to meet the new challenges, or will they shrivel and become a mere skeleton of what we now have? These are the kinds of issues to which we must turn our attention.

We have spent the past century developing a school system that has steadily moved toward reaching everyone. In 1900, the public schools graduated less than 10 percent of the population; while by 1970, the figure had reached closer to 70 to 75 percent.

This universal system of public schools has accepted the missions ascribed to it over the past decades: providing the masses with basic literacy, acculturation of its plural population to normative mainstream values (especially during the great immigration periods), and catering to the manpower needs of an industrial, capitalistic economy. The schools have attempted to deal with the intellectual development of those learners who were considered "academically able" and who were expected to progress through the schools, and have created streams for those who were perceived to be noncollege-bound and suitable for job entry. The structure designed to reach the masses revolved mainly around the schoolhouse, age group norms, standardization in curriculum and construction, courses of study, specially prepared professional and licensed personnel, and a pattern of reporting that ranked the learner in relation to others. To this structure was attached a secondary system of add-ons that attempted to keep pace with new societal demands: Adult Education, Special Education, Vocational Education, Early Childhood Education, Compensatory Education, and so on. While the school-age population expanded, so did this structure and the additional resources necessary to approach the tasks.

Symptoms of a Transforming Society

During the seventies, we began to experience the limits of growth in both the school-age population and our resources. The dramatic symptoms of a transforming society began to surface: intergenerational splits, moral and ethical decay, economic instability, energy shortages, environmental pollution, proliferation of mass weapons of destruction, population explosion, global starvation, familial and community deterioration, powerlessness, anxiety and stress, violence, "rip-offs." These symptoms point to a society under severe strain, whose needs now fall clearly beyond any one institution and schooling. What is at stake is what statespersons have long forecast: humanity is in a race between education and catastrophe--between mere human existence and human potential. Societal forces seem to control us rather than the other way around. Education can help humanity regain its sense of fate control.

We therefore need educated people who can begin to correct the wrongs surrounding us all--if it's not too late; educated persons who not only care deeply about the negative conditions that thwart the development of human beings, but who have the competence to act in ameliorative ways. Fully educated persons have a disciplined sense of caring and possess the expertise to perform the major societal responsibilities because they have learned the political, economic, and social roles required for constructive problem-solving. In sum, the educated person is someone who is in control of his/her fate in behalf of humanity and who is guided by the values of love, justice, and knowledge. Stated more directly, unless we are capable of delivering such quality education to every citizen as a matter of <u>right</u> not privilege, human and societal <u>survival</u> will be in clear and present danger. Education must become a process by which people and their society are renewed. These comprehensive goals for American education mandate that the traditional basics--the three "R's"--be acquired because they increase the learner's ability to control his/her own destiny. Surely, if a person cannot read and write, he or she is placed in a difficult, dependent position, restricted in seeking options that promote societal and personal expansion.

Similarly, if a learner does not have an opportunity to nurture a talent, his/her creative potential has not been fostered. Without cultivating talent, the learner's fundamental psychic need to be personally validated is seriously impaired. Utilizing a talent as a basis for a career is more desirable educationally than learning the skills to perform a job.

Further, unless each person is provided with the expertise to perform the so-called societal roles--for example, parent, citizen, consumer--then once more the tendency is to become dependent on others who can. The point must therefore be stressed that the educated individual is one who possesses the competencies for controlling his/her own development in a humane, responsible way. The educational system must then develop a delivery capacity to foster in each person those skills, attributes, and talents to be fully educated and truly verified as a distinctive person.

A postindustrial, democratic society such as ours requires an educated citizenry for political, economic, and social reasons. Therefore, a comprehensive <u>educational</u> system is required to replace the comprehensive <u>school</u> system that has been created and that is rooted to the needs of the past. We need a structure capable of coping with the future.

Thinking about an educational rather than a school system will necessitate not only a redefinition in function and delivery, but a realignment of the basic parties at interest: the recipients of educational services--parents and students, other taxpayers--and the deliverers of these services--professional educators, other community units including business and industry, labor, government, and the cultural and scientific agencies.

It is becoming clearer that the old ways of updating our schools through add-ons, appendages, and remediation will no longer be appropriate. Our present school system has not only spread itself thin but has surely developed unnecessary duplication. As society has become more complex, it has delegated increased responsibility to the schools; but the schools are designed for schooling, not for education. We therefore need to convert a school system into an educational system. To accomplish this goal, the school cannot go it alone. A much broader conception of resource utilization will have to be considered. The new educational system will systematically link a complex of institutions and agencies. The school will be linked to the strengthened family; to the multicultural neighborhoods; and to the cultural, scientific, and recreational agencies in the communities.

In one sense, we are at a point of asking each agency to perform certain functions contributing to the comprehensive educational system; thereby returning to first principles of social organization. That is to say, we are returning to a structure in which the family and parents are expected to perform certain "key" educational responsibilities--perhaps this time with the help of parenting support opportunities that are appropriate to the kind of diverse society we now have. Certainly, commerce and the arts can be expected, through their updated resources, to provide learning contexts that appeal to talent identification and nurturing of our citizenry. Similarly, spiritual leaders can join in providing sensitive formats for the development of moral and ethical attitudes that enhance the noblest values of a free and just society. The mass media can use their considerable power to reach all learners on a number of crucial issues affecting our lives. This will enable the superheroes who have entertained and inspired us in the past to use their appeal for more serious educational ends.

Schools Cannot Go It Alone

The point is that the schools cannot be expected to do it all within the confines of the schoolhouse. Expecting the schools to go it alone is to continue on a path that can only lead to greater frustration among all the parties at interest. Clearly, we have learned that the quality of life in our great metropolitan areas cannot be maintained or even developed without excellent education. Yet, the overburdening of the schoolhouse has had precisely such a destructive effect. It is time to utilize the rich learning environments and talents in the cities themselves through a new and more dynamic linkage of the schools to the other educational units affecting the growth of each person.

Therefore, just as in earlier times when the schools, the family, and the churches shared the responsibilities for learning and teaching, so will it be under an educational system. Only now, these fundamental units will be joined by other agencies such as business, industry, human service, and government, to form a new educational network--all under the coordination of primary development specialists, educators, and boards of education.

This means, in part, continuing to tap the rich educational resources in the communities surrounding our schools. As we face restrictions in direct allocation of additional resources to the schools, as we presently are, and as our school-age population levels off, as it presently is, then the search for priorities and resources commences, as it has.

We now appear to be in the initial stages of converting from a school to an educational system. One important development that has arisen relative to this conversion concerns the orchestration of multiple resources within and without the schools as a basic means for continuing our advance on achieving a new effectiveness in quality during a period of conversion for reliance on school-based services to community-based services that include schools. Linking the schools to the business and industrial environment for talent development, to the health agencies for nutritional awareness and drug education, to insurance companies for driver training, to the artistic network for cultural and aesthetic literacy, and to the spiritual leaders for moral and ethical actualization are but a few of the activities that need to be coordinated. Such expertise can be delivered by a reformed educational system and under the direction and supervision of educators who continue to be accountable to the public for promoting the growth of each learner.

An important consideration in the coordination and interlinking of these resources, talents, and tasks is their cost effective potential. Surely, it is conceivable that the multi-billions of dollars spent by business and industry in their own training systems and the millions of dollars spent by our libraries, museums, and cultural agencies on lifelong learning opportunities could be harnessed in such a way as to avoid unnecessary duplication and to interlock services into a more comprehensive yet coordinated pattern of education to provide a fuller utilization of existing resources. Further, public policy can enable cooperation among these institutions through various incentive and tax benefit plans.

The point is to provide a comprehensive system of education based on optional paths to quality education for each person. No one

agency can be capable of being all things to all people. Thus, through a systematic orchestration of resources, beginning with the school and extending into the community, the total effect may be to increase our capability to educate each distinct person, which has been one of our most cherished ideals.

Replacing the Present Structure

Politically, the educational system proposed is custom-tailored in that it is based on individual choice. Each person has the right to choose a range of optional learning environments. There is no attempt to have one right pattern to which all must adjust or be branded a failure.

The first signs of this conversion are already surfacing. In Dallas, Houston, Chicago, St. Louis, Minneapolis, Philadelphia, New York, Boston, San Francisco, Los Angeles, Detroit, and other cities and towns, "schools" are being replaced by educational centers located in rich environments such as medical complexes, art centers, scientific laboratories, governmental institutions, international trade centers, and the like. Proposals for a classical and contemporary musical education environment in which prominent artists become part of the faculty joining teachers who formerly had been associated with the schoolhouse are no longer farfetched dreams. Linguistic environments for students talented in languages, food and agriculture stations for students pursuing careers in these fields, aviation and space complexes, executive internships in engineering, architecture, law, human services--the list can go on, but the central idea is to create powerful education contexts manned by both the formal educators of our present school system and the enormous wealth of talents and competencies residing in the broader community. Needless to say, the orchestration of these resources to the benefit of each distinct learner is a monumental task that will require a redefinition of the role of traditional educator--coordinator, facilitator, linker--the shifting of role from one of providing direct service to one of harnessing the diverse human and material resources to assure continuity and accountability. Educators and boards of education can continue to be the central agents who will be responsible for assuring that the best interests of each person are maintained under the redefined system.

The process of converting a school system to an educational one cannot occur by dropping the present structure and replacing it with a new one. Quantum leaps are seldom attempted or successful. The conversion of a school system to an educational system must take place in a different way. Decentralization of the monolithic structure of schooling through increased options and choices among the basic parties at interest--parents, teachers, students, and administrators--is a beginning step in this direction. This decentralization is promoting a new diversification within our schools--from matching teaching/learning styles to schools within schools to alternative schools without walls. Slowly, the emerging educational structure is redefining who the learner is, when, where, how, and why the learner learns. Increasingly, education will be a matter of choice. Thus, the seeds of the future educational system are being nurtured today. This process is extremely significant, precisely because it is foundational in nature--a first phase. The process is important also because it embraces individual rights--the right of a teacher to choose a style of teaching, the right of a student and parent to select from different styles. The process gains political support because change is not by imposition but by personal attraction. People can begin to feel some sense of control over their own fate and over their constructive power to rebuild an institution critically tailored to nothing less than their hopes and aspirations.

Periods of transition are by their nature ambiguous, confusing, and uncertain. We need sensitive guidance from our leaders. We need to share a vision. We need to be inspired by leaders who have the capacity to rise above the immediate press of despair, illuminating for us the ingredients of a future marked by hope. This will mean also that enabling policies must be mounted by our elected officials. A tall task? Impossible? Perhaps, but what is the alternative? We seem to be in a period of reflection, rethinking existing policies, of admitting our past mistakes, of learning from our experiences. We are searching for a new flexible process of education. States are considering new legislation, making quality education a civil right for all--not just school-age children. We are now examining policies aimed at strengthening the American family, enhancing the effectiveness of parents as teachers.

Redefinitions are taking place in the basic building-block institutions such as the church and the family as they are in the fields of science, economics, and politics. It is not surprising that a redefinition of American education is forthcoming. The result will be no less than a monument to humankind.

R. Buckminster Fuller: A Synergetic Approach to Education

By Peter Wagschal

"Instead of the present "expanding world" curriculum which starts with the child's community and builds out to the world, Bucky's curriculum would start with the universe and build down to the child's local experiences."

Few twentieth century thinkers have achieved the comprehensiveness that is R. Buckminster Fuller's most characteristic asset. Though he carefully avoids labels, except for his self-created "comprehensive anticipatory design scientist," Fuller has won international acclaim as a poet, philosopher, mathematician, geometer, engineer, and architect. Although Fuller holds 40 honorary doctorates, he has not often been perceived as a "teacher" or "educator," though those labels are at least as appropriate as any others. Besides, teaching is what "Bucky" (as he prefers to be called) does most--with lively lectures all over "Spaceship Earth," with books that distill his ideas in carefully-hewn words, in his work with the countless "apprentices" who leave him with a fundamentally new vision of the universe, and with his casual conversations with friends, devotees and children.

Bucky is a good teacher. In fact, he is a remarkable teacher. In all of his speaking, whether it be to one close friend or to an audience of 2,000 in New Delhi, he exudes an enthusiasm, a sense of wonder and discovery, that are as contagious as are his ideas themselves. At 83 years of age, Bucky still approaches the universe as if he were a 5-year-old child--with the same excitement, the same awe at life's mystery, and the same openness to discovery.

All of Bucky's ideas and inventions are by-products of a unique, basic perspective which is, ultimately, his most valuable contribution. For a full discussion of that perspective, the reader can only turn to Bucky's magnum opus, Synergetics: Explorations in the Geometry of Thinking, a two volume 1000+ page work which carefully spells out this world view. Synergetics is, in effect, the wellspring from which all that Bucky has done flows. His geodesic domes, his Dymaxion Map, his work on world resource issues, his educational ideas--all follow quite directly from the basic conception of the universe spelled out in Synergetics.

The concept of synergy is the most appropriate place to start in trying to understand Fuller's thought. In fact, Bucky has waged a one-person advertising campaign to revive the very use of the word, "synergy": which means "behavior of whole systems unpredicted by the behavior of their parts taken separately" (p. 3). The properties of table salt, to take one of Bucky's favorite examples, are not predicted by the properties of its components' parts. That is, however carefully one were to investigate Sodium--a metal that ignites in air at room temperature--and Chlorine--a poisonous gas--one would never arrive at the conclusion that their combination--Sodium Chloride--is an edible, crystalline substance. The whole is not predicted by its parts. In fact, to understand the parts, you must first understand the whole so that you can see them in relation to it.

Carried to its "logical conclusion," the notion of "synergy" would suggest that no one can understand anything unless they first understand the largest whole--the universe. Now, it is one thing to agree--as many of us would--that salt is not predicted by Sodium and Chlorine, or--another of Bucky's favorites--that the gravitational attraction between objects cannot be found in any object but only in the relations of two or more objects. But is is quite another thing to set off on an intellectual odyssey that requires us to understand the universe first, before we can understand anything else! But that is precisely what Bucky sets out to do in Synergetics, and in everything else that he does.

"Universe is the aggregate of all humanity's consciously apprehended and communicated nonsimultaneous and only partially overlapping experiences" (p. 81). Embedded within this definition of the universe--a definition in

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which every word is very carefully chosen--are a variety of conceptions which pervade Bucky's thinking.

First, notice that the basic "units" of the universe are "experiences," not atoms or sub-atomic particles. Bucky's "universe" is physical and metaphysical, and no description of it that excludes the human mind can be complete. In its physical aspect, universe, Bucky claims, is "the minimum of intertransformings necessary for total self-regeneration" (p. 84). That is, the universe is the only perpetual motion machine--a system which is constantly transforming and regenerating itself. Governed by the Law of Conservation of Matter and Energy, the physical aspect of the universe is constant. The weighable, detectable, sensable, or machine-measurable "stuff" of universe is--throughout time--constant in its amount, though ever transforming in its nature.

The metaphysical aspect of universe consists of the external generalized principles (scientific laws) which regulate it, and of the human mind which is capable of understanding those principles. The "Laws" which govern the behavior of the physical universe are not, themselves, physical. On the other hand, those general principles can only be known through experienced "event sequences"--they cannot be intuited in ethereal abstraction from the physical events that constitute our experience.

Consider one of Bucky's favorite examples--a knot. The tying of my shoelaces into a knot is an event in the universe, and it comprises both the physical and the metaphysical. Without the matter of the shoelaces--or at least something to tie--I cannot have a knot. And without the special configuration of that matter into a particular pattern--and the pattern itself is metaphysical--I cannot have a knot. Each knot that I tie is what Bucky calls an event--a special case--comprised of my experience of physical matter as patterned by metaphysical principles: "The knot is not the rope; it is a weightless, mathematical, geometric, metaphysically conceptual, pattern integrity tied momentarily into the rope by the know-conceiving, weightless mind of the human conceiver-knot-former . . ." (p. 231).

Notice also that Bucky's universe is very closely linked to human beings. It is not a universe alien to humanity but rather one in which people play a central role--as experiencers, as knowers of the regulative principles, and--as we shall see later--as inventors of new technologies that reflect the universe.

In particular, human beings are unique by virtue of their "minds." While we share our "brains" with many other living creatures, it is the "mind" which Bucky sees as uniquely human. Brain is the organ of sense--the organ which enables us to experience particular event sequences. But mind is the organ that enables us to see through those particular experiences to the generalized principles that regulate the universe. It is by virtue of our minds that we are able to understand the functioning of the universe and, through such understanding, to create technologies which add new synergies to the universe: "Humanity can only evolve toward cosmic totality, which in turn can only be evolvingly regenerated through new-born humanity" (p. 85).

It is this mutual regeneration of humanity and the universe which makes Bucky's "theories" so closely tied to his "practice." Each basic understanding that synergetics attains is more than merely interesting, it is also important as a guiding principle for developing technologies which will literally transform the universe.

All of which leads to a crucial notion in Bucky's thought, the very non-economic notion of "wealth." For Bucky, wealth is composed of two elements--physical constituents of the universe (matter and energy) and the "know-how" of humankind. Since the total matter and energy in the universe is constant, and our know-how can only increase, so "wealth," human's ability to gain advantage for themselves from the materials of the universe, must always be increasing. This concept is central to Bucky's thought in that it represents a meeting point between his theorizing about universe and his design of particular pieces of technology.

Greater know-how is inevitably contingent on an accurate understanding of universe. Those technologies which are most successful are those which are modelled after the most wondrous of technologies. "Universe is technology--the most comprehensively complex technology" (p. 85).

Scientific comprehension of universe, therefore, is important for Bucky not merely for its own sake, but as a basis for designing technologies which follow the principles of universe's technologies.

Nature's design is so spectacular because it does so much with so little. The structures it employs gain the most advantage (especially those of living organisms) with the least expenditure of matter and energy. And that is precisely what human technologies need to do--more with less. Again, Bucky has some favorite examples of this: the ships made of modern alloys carry more cargo per unit weight than did their predecessors; geodesic domes enclose 600% more space with 400% less materials than do conventionally constructed shelters. In each case, the key to doing more with less is to design technology in accordance with principles and structures employed by universe itself in its own technologies.

As humankind's know-how continues to increase, and as we continue to do more with less, we may, according to Bucky, eventually be able to do so much with so little as to raise the standard of living of all of humanity to heights we have never dreamed possible. This is Bucky's notion of a "design science revolution"--rather than pulling the top down,

as is the case in political revolutions, the design science revolution will lift all to a standard of living beyond what any of us have experienced in the past.

But Bucky is not a naive optimist. He views the success of his design science revolution as being far from automatic. The present situation is, at best, critical. We face a choice, Bucky argues, between "utopia and oblivion," and the choice must be made quickly, as our present reliance on technologies which violate the universe's principles, and on political/economic systems which are based on scarcity rather than on the possibility of universal wealth, could easily lead to disaster before properly designed technologies lead us out of the morass. The key to our success, Bucky argues, is to seek not technologies which imitate Nature, but technologies which apply Nature's principles.

The major obstacle to the success of the design science revolution is humanity's distrust and misunderstanding of science and technology. This follows since 99% of humanity has no real understanding of technology, and fails even to realize that the universe itself is nothing more, nor less, than exquisitely designed technology. And why are we all so misinformed and distrustful of the obvious? Because contemporary science and technology hinge on mathematical models which bear no relationship whatsoever to the real world. Before the design science revolution can fundamentally improve the quality of humankind's life on Spaceship Earth, then, it must replace our present, misguided conceptions of mathematics--the gateway to understanding science and technology. That is what Synergetics is all about--a total overhaul of our mathematics and geometry.

The problem, Bucky argues, with our mathematics is that it is not based on the world of experience. It is, instead, totally abstract and divorced from contact with the event sequences of the universe. And, what is worse, since it has no relation to the real world, by using abstract mathematics we bend our understanding of the universe, and our design of technologies, to fit its misconceived assumptions. An experiential mathematics, based on the realities of the universe and following nature's coordinate system, would avoid these problems.

Our current mathematics leads to a variety of anomalies which Bucky frequently refers to. "Pi," for example, is the number that when multiplied by the diameter of a circle supposedly gives you the circumference of that circle. The problem is that "pi" is an irrational number--with no exact value. No matter how many places you carry it out to, you're never finished: 3.14159... On and on you can go, with or without a computer, and you never arrive at the final number which "finishes" the value of "pi." For Bucky, this is one of many crucial breakdowns representative of our entire mathematics. "When nature makes a bubble," Bucky speculates, "at what point does she cheat? When does she stop carrying out the indefinite sequence of numbers in "pi" and say, 'Well that's not an exactly round bubble, but it's good enough'?" Bucky argues that nature does not employ "pi" in making bubbles and her other spheres and so we should have no use of such an irrational number in our descriptions of nature.

There are many more examples: Because we employ a 90-degree geometry, with axes of "length," "width" and "height" at 90-degrees to one another, we are accustomed to frequent use of the words "up" and "down." In point of fact, of course, those words are totally inappropriate, for we live on a rotating orb which has no "up" and "down." What we call "up" is really "out"--outward relative to the center of our planet. And what we call "down" is really "in"--approaching the center of the Earth. Again, as was the case with "pi," our inadequate mathematics leads us to conceive of the world inaccurately, and to behave as if it were different than we know it--by our own experience--to be. Similarly, we continue to use the words "sunrise" and "sunset" when we know full well that the sun isn't rising or setting. Better, Bucky argues, to substitute terms like "sunsight" and "sunclipse" so that our language, our concepts, and our actions will more accurately reflect what we know about the universe.

What we need, Bucky argues, is a mathematics/geometry/design science which is based on experience rather than abstraction, however ingrained. "About 1917, I decided that nature did not have separate, independently operating departments of physics, chemistry, biology, mathematics, ethics, etc. Nature did not call a department heads' meeting when I threw a green apple into the pond, with the department heads having to make a decision about how to handle this biological encounter with chemistry's water and the unauthorized use of the physics department's waves. I decided that it didn't require a Ph.D. to discern that nature probably had only one department and only one coordinate, omnirational, mensuration system" (p. 108). Synergetics is the result of Bucky's lifetime attempt to describe that system.

Synergetic geometry, unlike plane geometry, does not begin with points that occupy no space, lines that have only one dimension, and planes with no thickness. Instead, it begins with real structures that, with a minimum number of elements, maintain themselves and therefore have structural integrity. Those structures--always four dimensional--are the real "building blocks" of the universe, and it is their geometry--and the geometry of their transformations--that we must understand if we are to comprehend the world in which we live, and if we are to avoid the problems--pollution, war, etc.--that grow out of our present confusion.

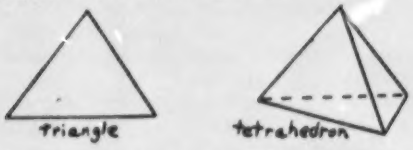
If you play around with some toothpicks and dried peas, you will find that the simplest

shapes that maintain their shapes even under stress are triangles and/or tetrahedrons. That is, if you want to make something that holds its shape, the least number of toothpicks and peas you can use is 3 of each to construct a triangle. The triangle with equal length sides and equal angles is Bucky's starting point for exploring nature's geometry. Where the conventional geometry that leads to such anomalies as "pi" starts with an "x-y-x" coordinate system of lines at 90-degree angles to one another, Bucky's synergetics is a geometry of 60-degree angles.

The triangle, remember, is only a conceptual starting point--it will not do as a building block for the universe because it lacks one feature that all experiencable structures must possess--an inside and an outside. As accustomed as we are to our familiar but abstract mathematics, it is difficult to follow Bucky's continual insistence on a truly experiential mathematics. Beginning with inside-ness and outside-ness is most unfamiliar, but consistent with Fuller's unique perspective.

One of Bucky's frequently-used examples may help here: Suppose I asked you to draw a triangle on the ground, and then ask you how many triangles you have drawn. Your reply would probably be "One." But Bucky's reply would be, "Four." There is, first of all, the small triangle that you intended to draw. But there is also the large--very large--triangle composed of the rest of the planet Earth . . . everything that is outside the small triangle. For we do not live on some infinitely extending plane, as our conventional geometry assumes, but on a finite sphere, and when you draw a small triangle on the ground, you have also drawn a much larger triangle surrounding it. But where are the other 2 triangles that Bucky claims you drew? Since you drew the two triangles on a ball--a curved surface--they each have a convex side and a concave side--i.e., depending on whether they are viewed from inside the ball or outside of it. Thus, Bucky argues, every time you draw a triangle on Earth, you draw four triangles--one small and concave, one small and convex, one large and concave, and one large and convex.

Since all our experience is composed of structures having insides and outsides, the triangle therefore is superceded in Bucky's geometry by the structure which most economically--i.e., with the smallest number of elements (angles and lines)--possesses an inside and outside: the tetrahedron.



"The Tetrahedron is the first and simplest subdivision of Universe . . ." (p. 334). "The triangle is the minimum polygon and the tetrahedron is the minimum structural system . . ." (p. 335). The tetrahedron, as the minimum possible structural system, is the basic element of synergetic geometry. Starting with triangles and tetrahedrons and a 60-degree coordinate system, Bucky builds a complex geometry that, being based in experience rather than abstraction, accounts--he claims, for the discoverable realities of the universe. And it does so without the anomalies of "pi" and without having to resort to non-existent conditions (points that have no dimensions, lines with no thickness, etc.).

Synergetics is an elaboration of the consequences of a geometry based on many kinds of realities. It is, without question, the work which will form the basis of humanity's ultimate judgment of Bucky's contribution. It is also the work which reveals the assumptions which underlie all of Bucky's work.

Synergetics may well be more central to Bucky's educational thought, and education may well be more central to the future of the synergetic perspective, than anything else. For if Bucky's thinking is accurate, then our entire educational system--like our building industry which starts, mistakenly, with squares and stones instead of triangles and light metals--is askew, out of step with the universe. The changes necessary to make education conform with the principles laid out in Synergetics are awesome in their magnitude, and they range from minute detail in mathematics curriculum to the very structure of education as an institution.

To begin with, our educational institutions will have to relinquish their devotion to specialization. The principle of synergy requires, first and foremost, that we all become comprehensivists first, before we go on to tackle specialty areas. The schools will have to develop curricula for the youngest children which start with the most general understandings of the universe (synergetic geometry, for example) and build down from there. Instead of the present "expanding world" curriculum, which starts with the child's community and builds out to the world, Bucky's curriculum would start with the universe and build down to the child's local experiences. Furthermore, Bucky's curriculum would have no room for our conventional disciplines. Nature does not have departments of physics, chemistry, biology, etc., and neither, he argues, should we.

The process of education must be remodeled as well, if it is to fit with the kinds of understandings presented in Synergetics. Educational institutions are, after all, humanly-created technologies and, like our other technologies, they should be "constructed" in accordance with our comprehension of the universe, so as to do more with less. It is from this perspective that Bucky's insightful observations on the possibilities inherent in electronic technologies develop. Wherever the invisible technologies (i.e., communications/computer/video/audio/electronics) can provide a more efficient set of learning possibilities

for children (or adults) they should be used. Ultimately, Bucky argues, this will mean the end of the school itself, as electronic technologies make every conceivable educational experience available to each of our homes.

Most significant, however, in terms of the general directions of Bucky's educational thought, is his faith in the imaginations, curiosity, and intuitive judgment of children. We adults are, in many ways, beyond hope. We have grown up in a world of "up" and "down," of "sunsets" and "sunrises," of basic misunderstanding of the universe. Children, however, are open to their experiences. If they are provided with real understanding of the universe that meshes with their personal experience, they will pick it up rapidly and eagerly. The smallest children, Bucky argues, are our best scientists, for they only believe what they learn through personal experimentation with the universe. If our educational institutions could encourage that, rather than forcing it to fit into a system of mathematics and specialization that has no basis in reality to begin with, then learning would proceed beyond our wildest expectations. If we could help children experience "sunsights" and "sunclipses," "jumping out" and "falling in," and provide them with the conceptual tools for an accurate understanding of that experience, then the 99 per cent of humanity that is afraid of technology would soon leap into an entirely new era. The design science revolution would be upon us, and we could go about the business of developing and employing those in-tune-with-universe technologies that will enable us to live equitably and at a standard of living never before considered possible.

A Language Arts Teacher Meets the Computer . . . Tentatively

by Denise Holmes

A humorous look at a teacher's "learning problem."

Until a few weeks ago, I would have said, had I been asked, that APL was some obscure government agency, or perhaps a new flash-frozen fruit compote. But now I know, for better or for worse, that APL is a computer programming language--in fact, A Programming Language. Direct and to the point. I like that; I used to teach English.

But that was a former life. Now I am wending my way along one more academic pilgrimage, in search of Life's Meaning and, incidentally, Another Graduate Degree. But a course in computers? "A necessary part of any graduate student's liberal arts education," said a handsome friend. And I believed him. I enrolled.

Let me say that I approach technology bravely. Could I afford one, a microwave oven would pollute my kitchen. I gave up grudgingly those chemically-preserved convenience foods (with shelf lives longer than my own) only when peer pressure became unbearable. I wince only slightly when the hygienist says "Bite," and then blasts me from the neck up with X-rays. And I accept dutifully the monthly computer statement from my bank and re-subtract doggedly until my own ciphers match the bank's unerring tally. What takes me hours a computer does in the blink of an amber light. I have to respect that.

So now, every few days, I march bravely to the computer terminal. "Be gentle," I pray. "Your power is awesome." And every few days I struggle to unravel the latest tangle of functions and arrows that relentlessly emerge from what I thought I understood so clearly. "I have a good mind," I keep telling myself.

And weekly I march to class, reverently filling notebook pages and marveling at the technological wonders unfolding before me. The confusion lurking just beyond my level of articulation seems sufficiently benign. Understanding is perhaps within my grasp. Finally.

I should know better. There was that telling moment early on when the professor asked us to write down three activities that we believed the computer could not do. I drew a blank. The computer's limitations? Then, one idea came to mind. "Make love," I wrote into my notebook. I drew a line through the words. "I'm not on the right track," I thought. Next to me my handsome friend was writing feverishly. Terrific. Were it not for him, I could be home right now, balancing my perenially unbalanced checkbook.

Technology. Computers have seemingly limitless applications in the classroom. I

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know that. I take it on faith. But no one will convince me that they are panaceas for our educational ills. I will admit--albeit grudgingly--that educators have much to learn about the process of "learning." So many times I have been faced with the realization that a student's "learning problem" is really my "teaching problem." And now, as a "learner," can I pry myself away from the notion that I have a "learning problem?" Perhaps.

I struggle on. What keeps me going are the possibilities that exist for computer-aided learning in the language arts. I don't know them all, but I can share four strategies that are perhaps representative of the computer's potential.

Language Arts Drills and Tutorials. Perhaps one of the most exciting possibilities for this simple use of computers is with older students in need of remedial skills development. What might otherwise be an activity with no inherent power of motivation ("Who wants to learn this 'baby stuff'?") may be transformed into a far more sophisticated experience when it means that a student controls and interacts with a computer terminal.

Related to this process is "Speak & Spell," manufactured by Texas Instruments ($50). This small, colorful microcomputer asks a child to spell a word, says each letter as the child types a response, and then tells the child whether or not s/he is correct.

Not all students in need of skills development may enjoy or benefit from a computer approach, but many students have found computer drills and tutorials an exciting and productive way to learn.

Teacher Assistance for Library Information. With the computer's capacity to store and retrieve information, teachers can save themselves hours of exhaustive research for materials. The current ERIC Search system is only a harbinger of future possibilities: more information available more quickly, and in a variety of forms.

PLATO (Programmed Logic in Automated Teaching Operations). Developed at the University of Illinois and funded by the National Science Foundation and the Illinois State Department of Education, the PLATO system provides a screen which the child can control through one of various means. For example, when a child points to a noun with a small light pen, an animated representation of that word appears. When the child then similarly indicates a verb, the picture comes alive by performing that action. Thus, the child sees concretely how his/her familiar world of experience relates to the structured printed language.

Microcomputers for Physically Handicapped Children. Children with severely limited physical or verbal abilities can operate microcomputers which aid them in their learning experiences. For example, a microcomputer with a display screen and cursor (a blinking light that scans the screen) can be fitted to a wheel chair. The child is then given a switching device that can be operated by an appropriate muscle in his/her body (even the tongue pressing against the palate has been used). After the child views the question or problem on the screen, the cursor moves along the choice of responses. When the cursor reaches the child's choice, s/he activates the switching device and the computer checks the child's response.

All four of these possibilities are exciting to me. And the "prohibitive costs" argument can no longer shield me from the reality of computers in the classroom. Nor can I use the argument that I am not a computer expert, because a teacher doesn't need to be an expert (or a genius or even a former math major) to get along with a computer in the classroom.

Granted, most computers cost more than most textbooks, but even that trend seems to be reversing (take a look at the cost of textbooks). And granted, computers aren't about to replace either the textbook or the teacher (at least, nor during my career). Perhaps not every student can benefit from computer-aided learning, but I never found textbooks to work with all students, either.

So I face the possibility that the computer is not a god, but a fact of technological life that is even more accessible to me than my coveted microwave oven. And that I, as an educator, have a responsibility to investigate its uses.

And my APL programming course? Well, tomorrow I will return once again to the terminal. I will say, "You are not a god," even as the terminal's keyboard blurs into the altar where I will once again offer up my ego and pray for grace. But tomorrow, just maybe, my program will run.

Exploring Some Basics of Technology Literacy

By Peter Wagschal and Robert Kahn

"We simply do not, and will not, know enough to make confident statements about the consequences of using--or electing not to use--our most powerful present and near-future technological discoveries. What we can do (technology) has far outstripped what we know (science)."

There is a building confusion in America today over the proper role of science and technology in our society. On the one hand, we are in debt to scientific research and technological development for the construction of our materially successful civilization. Yet, increasingly, people are questioning the direction of scientific research and technological development as serious crises involving them arise. Our social consensus over the inherent benefits of science and technology has appeared to weaken, though at the same time, even the severest critics propose solutions to technological crises that involve better technology or more expert scientific research.

Consider for example, the 1973-74 Arab oil embargo when Americans first felt their society's precarious dependence on fossil fuels for energy. For many, the revelation came as a shocking awareness of the tenuous foundation of our complex civilization. Though a chilling sense of doubt spread over us, we turned to our technological community--who were largely responsible for this very dependence--for alternatives to it.

Public support for science and technology seems to be waning, while in its place, we have yet to build concensus around new roles for science and technology.

Much of the confusion regarding the proper role of science and technology in American society flows from the mystique they hold for the public and its governing institutions. The increasing polarization of debate on such issues as nuclear power, supersonic transport and genetics research, suggest that many critics have substituted their initially inflated expectations for science and technology with cynicism, while the defenders of unfettered "Progress," redouble their faith. At nearly all levels of society, a distorted understanding of the actual capabilities and limitations of scientific research and technological development remains.

Public confusion is so fundamental in this regard that the unique qualities of science and technology have been obscured. The terms are used interchangeably, with little or no understanding of their distinct natures. This fundamental confusion can explain much of the current dilemma over the proper role of both science and technology in our society.

In this paper, we define science to mean "the quest for knowledge for its own sake." Scientific inquiry begins with the supposition that it is better to know than it is not to know the workings of the universe. Scientific inquiry is (or ought to be) independent in that it investigates phenomena apart from the material benefits which might follow from its discoveries. Without "direction," science freely pursues paths of inquiry only so as to learn more. Scientists do not direct their efforts so as to gather more from nature or even to enhance technical ability. As Michael Polanyi has written, whereas an invention is protected by patent, a discovery is not, for the following reason:

> In feeling his way towards new problems, in collecting clues and pondering perspectives, the technologist must keep in mind a whole panorama of advantages and disadvantages which the scientist ignores. He (the technologist) must be keenly susceptible to people's wants and able to assess

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> the price at which they would be prepared to satisfy them. A passionate interest in such monetary constellations is foreign to the scientist, whose eye is fixed on the inner law of nature. (Personal Knowledge)

The timeless, eternal quality of scientific discovery has no marketplace value that need be protected by a patent as compared with the ingenuity of technological designs which may follow and apply that discovery.

The direction of technological development, therefore, is qualitatively different from that of science. Technology is directed by the worldly considerations of human need and desire. We define technology as "the attempt to harness scientific knowledge for human benefit." Its success is ultimately defined in its ability to provide, while scientific success is characterized by the ability to know. Technology is intimately interwoven with the contemporary concerns and priorities of its society with its unique social and temporal context. As Polanyi points out:

> A brilliant invention is often rendered worthless and indeed farcical, by a rapid change in the values of the means used up and the ends produced by it . . . tram cars are as absurd today as the horse-drawn buses they once replaced. By contrast to this, the validity of a scientific observation cannot be affected by changes in the value of goods. If diamonds become as cheap as salt is today, and salt as precious as diamonds are now, this would not invalidate any part of the physics and chemistry of diamonds or of salt. (Personal Knowledge)

These distinctions between science and technology are not meant to imply there are no relationships between the two domains. Quite the contrary, for by understanding their their disparate aims, one can more clearly look at the useful--and the dysfunctional--relations between science and technology. Science, for example, by expanding man's knowledge of his universe, opens up whole new realms of possible technologies. And technology, by providing new means of investigation, often opens up whole new realms of possible knowledge. Without these "investigative technologies" (e.g., the microscope), scientific knowledge would hardly be possible. And, as we shall argue shortly, technological developments which surpass by too much the realm of scientific knowledge may hardly be desirable.

With these definitions in mind, the confusion in American society over the proper role for science and technology can be best understood with an appreciation of the fact that technological development has come to dominate scientific understanding, and that it is because we act without full knowledge that our technical accomplishments are often undercut or cancelled out entirely by the unanticipated costs resulting from them.

Consider one solution for America's increasing dependence on foreign sources of fossil fuel intensively promulgated since the Arab oil boycott: large scale electrical power generated with fission power, which substitutes one finite fuel (oil) for another (uranium). With the safety hazards associated with disposal and reprocessing yet to be resolved, nuclear power may offer a "cure" reminiscent of the iatrogentic diseases caused by modern medicine. The best of intentions are often at a loss when know-how and technique outpace scientific understanding.

To put it another way, this approach to technology literacy takes a unique position regarding the science/technology relationship and regarding America's present need for technological literacy: where other such efforts seem to assume that the problems of science and technology are easily resolved once the public is educated regarding the likely consequences of new technologies we make no such assumption. Quite the contrary. We do emphasize the need for knowledge of technological consequences when such knowledge is available. But we also recognize that, for many of the most important technological discoveries of the coming three decades, scientific knowledge of likely consequences simply will not exist at the time when implementation is a crucial issue. We simply do not, and will not, know enough to make confident statements about the consequences of using--or electing not to use--our most powerful present and near-future technological discoveries. What we can do (technology) has far outstripped what we know (science).

The conditions we have described--confusion over the respective functions of science and technology, the mystification by the public of the scientists and technologists, the dangerous problem-solving strategies which in turn generate scores of new problems--have all contributed to the imbalance of science in relation to technology.

With no qualitative change in this situation, the future will bring ever more explicit and forceful social and environmental impacts. The lead times between scientific discovery and technical application will continue to shorten, as they have in the recent past, greatly condensing the time available for the political process to judge the value of these developments. Also, as has been the case in the recent past, much of the purely scientific research and development of the future will itself be hazardous, not only to the individuals participating in the research, but to the general public as well. The decisions that must be made in the short and long term future regarding technological development and dissemination will challenge every social institution in our society and impinge on the

health and well-being of millions of Americans.

To rebalance technique with knowledge is a difficult task. It is only with a technologically literate people that the next vital steps can be taken in resetting the balance.

As we seek to build technological literacy, enhanced appreciation for unfettered scientific inquiry will be encouraged to close the gap between what we can do and what we know. Furthermore, a program to develop technological literacy cannot wrest basic science from its undue affiliation with the development of technology: that most important task will have to follow from a better understanding of the respective roles of science and technology--an understanding which we see as one central element in technological literacy.

Our definition of technological literacy is made up of the following aspects:

(1) An understanding of the difference between science and technology and an ability to recognize examples of each.

(2) A shift away from mystification of technological expertise and undue reliance on expert opinions.

(3) Ability to ask pertinent, important, central questions regarding development, dissemination and impact of particular technologies, and ability to separate forthright answers from evasions.

(4) Ability to recognize values issues associated with particular technologies and their introduction.

(5) Finally, a willingness of the technologically literate to participate in discussion and debate along with the political decision-making process regarding technological issues.

This definition promotes a "soft" rather than a "hard" understanding of technology. The emphasis is on building intelligent public participation in the decision-making process regarding technological issues. The technologically literate person can recognize the values informing respective positions, and therefore participate in the decision-making process at a sophisticated level.

It should be noted that the traditional notion of technological literacy as an understanding of the social/environmental consequences of employing particular pieces of technology is deliberately absent from our definition. As we have already argued, one of the major dilemmas and problems of our times is the fact that technology has so far excelled science, that--in many of the most important instances--not even the "experts" can agree on such consequences. Further, to expect such detailed technical knowledge on the part of a large segment of the American population would be both impractical and unnecessary.

In place of this traditional conception of technological literacy as detailed knowledge of consequences, we stress (1) knowledge of general principles (e.g., what are science and technology generally all about and how do they relate to each other?); (2) values (e.g., the value of knowledge for its own sake and the need for a clear set of values in making decisions about technologies when knowledge is simply not available); (3) involvement and wide-spread participation in decisions regarding the uses of technology; and (4) cogent questioning. To put this last aspect of the definition as starkly as possible, it is our aim to develop a citizenry which asks the right questions about all technologies as they are developed and as they seek implementation, and which will not stop asking those questions until they receive "real" answers. Such a citizenry would, we argue, go a long way toward exposing the gaps between what we know and what we can do; would force the public airing of expert estimates of the consequences of various technologies and would in itself help to demystify the current aura of the scientific experts. For us, technological literacy has much to do with an active, questioning, value-conscious public, and very little to do with a populace that understands the inner workings of a breeder reactor.

A glimpse of a technologically literate society suggests a much greater degree of participation in decision-making regarding technology. A technologically literate public would diffuse the polarization found in many contemporary debates over technological development as the public became better informed, more confident, and more clear about their values. The willingness of the technologically literate to participate in the decision-making process would insure that the public interest would be intelligently and forcefully represented and that important social values would better inform technological decisions.

Further, technological literacy (at least in the terms defined here) is no less necessary for the professional scientist or technologist than for the "average" citizen. In the present, and likely future, state of fragmented, specialized science and technologies, the professional is no more literate in areas outside his/her specialty than anyone else.

Technological literacy must be built at all age levels. Insofar as it is possible, equal emphasis should be placed on educating people for technological literacy from elementary through adult education. Whereas a technologically literate public is needed now in making important decisions, the decisions of the future to which we have alluded will also require a level of sophistication which is rare at present. An educational effort

which approaches all age levels simultaneously is necessary and mutually reinforcing.

A technologically literate society will be confronted with extremely difficult decisions in the future. One characteristic of such a society will be its willingness to recognize the limits of literacy, when even the finest information cannot assist in determining the possible long-term negative impacts following the introduction of otherwise beneficial technology. In a way that contemporary American society is unable to, a technologically literate society would address the fundamental question: what do we do when we don't know the possible effects of a given technology and cannot know for a long time? The technologically literate society will not shy away from the difficult questions but wrestle with them so as to determine the best directions society should take in such situations to insure its own well-being and that of its posterity.

An educational program in technological literacy is needed as a major step in redressing the imbalance between technology and science in American society which results in our acting before we adequately know the full range of resultants of that action. A technologically literate public would raise the sophistication of debate regarding technological issues and insure that the public interest was fully represented. Furthermore, a technologically literate public would confront the fundamental questions which today are being ignored.

Through the Briar Patch of Educational Futurism

by Stephen Anzalone

"Asking an educator to suspend commitment to his usual bromides so as not to prejudice his vision of the future is like asking one of the Joint Chiefs of Staff to have lunch in the mess hall with the guys."

Most educational planning exercises undertaken in the United States during the 1960s failed to discover the significance of the postwar baby boom. Poor analysis coupled with a myopic and idealistic faith in the value of education resulted in the failure to see that the effects of the baby boom bulge were to be short-lived, and that a permanent expansion of school buildings and tenured teachers would soon become the source of numerous problems. The consequences of these errors have been serious. By themselves they are probably justification enough for the current interest in educational futurism and important as a clear mandate to this activity.

Today, there are a substantial number of persons and institutions at work grappling with the future of education. They have produced countless articles and books--of widely varying perspective and quality--addressing a range of issues deemed to be important for education in the future. Most of the people who are asked to assess the future of education tend to be educators or scholars of some notoriety. The value of their contributions, taken as a whole, is certainly debatable. It is not clear whether the more systematic attempt to deal with the future of education will add up to anything either significant in its own right or sufficient enough to preclude mistakes like those made with respect to the baby boom.

Educational futurists stumble, more often than not, into a variety of analytical pitfalls. The first source of difficulty relates to the use of "trends" and is one common to all futurism. The second set of pitfalls is more diverse and seems peculiar to the educator's particular brand of futurism.

The Trouble with Trends

Any attempts to deal with the future, except perhaps those of science fiction and utopian literature, require that we view certain changes taking place as trends. These trends are projected in time and constitute our vision of the future. Then, either explicitly or implicitly, a probability is assigned to whether something will take place, based upon these projected trends. But the specification of this "probability" turns out to be nothing more than an expression of our degree of belief in the likelihood of a particular occurrence. The classic example of this kind of misrepresentation is the expression of probability that an "all-out" nuclear war will be likely to occur. A 50% "probability" of all-out nuclear war means simply that

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a Pentagon forecaster is half convinced that it will happen. The probability statement tells us more about the individual prognosticator than it does of the dynamics of the situation being examined. Unfortunately, futurists too frequently make use of probability statements to attempt to mystify the layman or to lend an air of science to what may be purely guesswork.

The problem of probability aside, the real difficulty futurists encounter in dealing with social trends is two-fold: proper identification and correct determination of future direction and magnitude. The first part of the problem confounds the would-be futurist as much as it does the editors of Time magazine. Simply being on the look-out makes one overly susceptible to "seeing" significance in the non-significant. Both futurists and the Time editors make their living by deducing some lasting significance from the daily panorama of "big events," and subsequently "packaging" them into trends. These trends grow even more significant when they are invariably correlated with something reported the week before. But too often what looked like a trend turns out to be nothing more than an important event or series of related events that prove--as a guide to the future--to be either of no help at all or to have taken us the wrong way. Trends have the same built-in obsolescence that many manufactured commodities have. We forget past covers of Time as easily as past Super Bowl games.

The other nub of the trends problem is that of determining future direction and magnitude. Even when we do find something of more than transitory significance--and some trends, such as how the economy is faring, what might be happening to birth rates, where shifts are occurring in social structures, are usually important in any social forecast--we often miss entirely where the changes are leading and how significant they might prove to be. Most forecasts nail down what may be a real trend and then fall into error by extrapolating it into oblivion or else completely underestimating the potential effects. A good example of the former can be found in the book Campus 1980: The Shape of the Future in American Higher Education, edited by Alvin C. Eurich (Delta, 1968). A very distinguished group of educators and scholars took up the task of forecasting the terrain of American higher education in 1980 from the perspective of 1968. Although it is not possible to treat each writer's contribution to this effort as part of a unified statement, there are to be found some unmistakeable tendencies. The most obvious deficiency with the collection of "forecasts," which becomes more discernible now that the day of reckoning approaches, was the assumption that the tempo of change, the climate of opinion, and the public funds available to education during the Sixties were part of a trend and that this trend would continue in the same direction--up, up, and away. Of course, the Seventies proved to be very different. What were seen as trends were not trends at all; educational change proceeded in a different direction and the rosy picture of a very different "Campus 1980" has not materialized.

Some other Pitfalls

The above-mentioned source of difficulty plagues much of educational futurism and other attempts at social forecasting as well. Educational futurism, however, has managed to generate some pitfalls of its very own. Examples of the pitfalls can be found in any number of books and articles purporting to deal with the future of education. The examples cited here are from two well-known collections: The Future of Education: 1975-2000, edited by Theodore W. Hipple (Goodyear, 1974), and The Future of Education: Perspectives on Tomorrow's Schooling, edited by Louis Rubin (Allyn and Bacon, 1975).

Frequently encountered pitfalls include the following:

"The Gee Whiz Pitfall" The forecaster, like any number of advocates of new curricula, enunciates an arbitrary catalogue of events: shifts in taste, fashion, and other matters of the moment. All of these are then propelled forward, either separately or together in some "crisis" package; the forecaster manages to dazzle himself, which makes the prescriptions all the more (or so it seems) compelling. Harold Shane's article in the Rubin book is a good example. Shane takes us through a selective Alvin Toffler-like tour of assorted new developments on the horizon, such as lifelong learning, quality of life considerations, the role of media, and "zero tolerance." The conclusion for the future can be none other than that we need new curricula, with different content and greater flexibility, to help people cope with change and prepare for the future.

"The Splendid Isolation Pitfall" Attention to the social context of education is either insufficient or nonexistent. Educational change is seen as operating in a vacuum and according to its own dynamics. Most forecasts for the future role of educational technology in instruction stumble on this pitfall. The numerous forecasts of a major role for television in education paid too little attention to the technical capabilities and potential of this medium and not enough to such things as the social situation of schools and communities, or the concerns of teacher interest groups.

"The 'Don't Bother Me with Details' Pitfall" No attempt is made to distinguish between what seems probable and what is only possible or between what may be desirable and what is possible or probable. Consider as an example a bit of prophecy from Hipple's article in his own book: "Classroom discussions, small group work, and independent study

projects will replace the teacher's lecture as the standard teaching tactic. There will be more questions than answers, more asking than telling." How are we to take such a prediction? It appears as a statement of something not just possible but probable. At closer inspection, the prediction seems to be little more than a wish. A wish should be labelled as such unless we provide arguments why the likelihood of the wish's coming to fruition is any more probable tomorrow than today.

"The 'If at First You Don't Succeed' Pitfall" The insignia that educators wear on their sleeves are the prescriptions that they have to peddle. Asking an educator to suspend commitment to his usual bromides so as not to prejudice his vision of the future is like asking one of the Joint Chiefs of Staff to have lunch in the mess hall with the guys. As a result, the future becomes nothing more than a repository for stale prescriptions and bright ideas that have not made it so far, but owing to any number of reasons, have become all the more vital for tomorrow. An illustration of this is the article by Fred T. Wilhelms in the Hipple book. Wilhelms prescribes for the future two purposes for education:

> To go straight to the great social problems of our day, and equip each young person to help solve them and take our society to a new ground. To go straight to the full potentiation of each young person, helping him as much as we can in his own personal becoming.

All of this is unassailable, if more than a little utopian. But such prescriptions for the future have been with us at least since John Dewey. Why, we might also ask, is the prescription for self-actualizing education something vital for the future, given that the visions of Maslow, Rogers, et al., have had little impact in schools to date?

"The 'So How Are You Going to Get There From Here?' Pitfall" Here the forecaster makes no attempt to identify a "motor" or "agency" of change and proceeds merrily and prescriptively on the view that good ideas simply legislate themselves into change. This pitfall is also common to most of the educational reform and educational muckraking literature. A good example is the mystical article by Charles Weingartner in the Hipple book. Weingartner would have us make use of transcendental meditation in schools and is at no loss for other ideas. He claims that "Education in the future must help students become aware of how they make meaning . . ." By what agency could we possibly come to do that? Weingartner's future is one that asks the schools to apply knowledge that does not exist, to make operational something that has not yet been discovered.

These are brief glimpses of some drawbacks that are found in attempts to deal with the future of education. These sources of difficulty might also serve as guidelines to the reader when analyzing a piece of educational futurism. More importantly, however, they might serve as a set of challenges to practitioners--challenges that will have to be met if our current interest in educational futurism is to redeem itself as something more significant than a passing fad.

Education, Societal Learning and the Future

by John McClellan

"Learners live and learn in a world of lesson-sets as necessarily as they breath in our atmosphere. So in some ways it is more complete and accurate to talk of learning as a social process than to talk of it occurring in isolated individuals. By comparison, an apple is not just the product of a tree, a mere stick of wood. The tree plants roots in the soil and spreads its leaves to the sun, and the apple is the product of the whole."

We who are both educators and futurists sometimes find ourselves torn between our concern for individual learners and our concern for society. As teachers, we want to help individual students learn; as futurists, we want to help society in some sense "learn," to change its views and ways for the better in a changing world. At first, these two concerns, far from seeming disconnected, seem directly related. How else shall we have an intelligent society than by preparing intelligent members of it? Is that not why many of us entered teaching in the first place? But the teacher who hopes to change the world in "Soc 101" soon abandons teaching. Or she may continue teaching, on the assumption that at least indirectly society's chances for change are increased if it is composed of educated citizens open to change.

However, even that assumption is one I have begun to question. I see around me many open and intelligent people eager to promote social change but powerless to do it. In positions of power, I see the "best and brightest" get us into Vietnams they can't get out of. I see bright young physicists accepting jobs making weapons they do not want to make. I watch the U.S. and U.S.S.R., both boasting of their success at "mass education," edge us closer to mass annihilation. Individually, we know the threats, but collectively we don't know how to meet them. Educating intelligent members of society may be a necessary condition for an intelligent society, but it does not appear to be a sufficient one.

Thus, I have turned my attention from concern about how individuals learn to concern about the ways in which social systems may be said to learn. I am interested to know how individuals' learnings get raised to the level of lessons that guide society at large. I am pursuing the topic for my dissertation. What is needed at the outset is a clarification of terms and concepts. What follows are some of my thoughts so far.

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Social Learning Systems

A social system may be seen as composed of two main elements: (1) learners, and (2) lesson-sets. By "learners," I am referring to individual humans. By "lesson-sets," I mean collections of socio-cultural elements like tools, social structures, world views and languages. All these cultural elements are learned things. They are the product of a vast number of learners' efforts. When I drive a car I am using the lessons of Henry Ford and countless other learners. When I buy gas I am participating in a social and economic structure which is the result of countless decisions by a vast number of people. When I assume the material pie will always get larger, I am sharing a world view learned by millions of new world forebearers. When I use the phrase "limits to growth" I am using language developed by others. I live in a world of lessons.

There are ways that lesson-sets seem to have lives of their own beyond the lives of individuals, to be "supra-individual." We drive cars though Henry Ford is dead. The phrase "limits to growth" channels my thought and talk even though I have never met the individuals who first used it. Although John S. Mill wrote about the limits to a growth economy, and Thomas Watson of IBM earned millions selling computers, neither could predict that computers would be used to simulate the limits to a growth economy and to point to weaknesses in our industrial way of life. Lessons seem to have potentials unanticipated by the original learner, and evinced in combination with other lessons by other learners. That lesson-sets are "supra-individual" can be seen by the fre-

quency of simultaneous discovery. It is almost as if it does not matter whether Darwin or Wallace or Smith gets the credit--the theory of evolution was bound to emerge from the lesson-set. There is a final way lesson-sets are "supra-individual": they form and channel the ways in which individuals learn. What I am writing here is triggered and directed by lessons I have learned from Kroeber, Meadows, and Mom. Without those lessons I could hardly think; with them I think out thoughts set by the lessons' own combinatorial possibilities.

Lesson-sets, however, do not exist in a vacuum, despite their supra-individual traits. They are the products of individuals' learnings. They are changed as individuals get new ideas and those ideas are impounded by society at large. Of course, most individuals never appreciably change the lesson-set. But some do. And the process involves the travel of ideas from individual to individual until the social system has incorporated the idea into its lesson-set. The travel is through the land of the existing lesson-set, and usually involves alteration of both the new idea and the prevailing lesson-set. The ideas travel on the lives and careers of individual learners.

Thus--and this thought is central to my perspective--the process involves a dialectical interplay between individual learners and socio-cultural lesson-sets. When that dialectical process brings about a change in the prevailing lesson-set, the social system can be said to have "learned." That learning is distinguishable from individual learning because it consists of a change in something supra-individual, the lesson-set. It is not the product of mere individuals; it is the product of a social system composed of both individual learners and supra-individual lesson-sets.

For instance, when a new technique for the foam insulation of homes becomes widely available to society, the society can be said to have learned a new way of dealing with its energy problem. Or when Congress passes a law encouraging insulation of buildings, or when the need for conservation is preached in textbooks and practiced in classrooms, or when "kill-a-watt" is on most people's tongues--in all these cases, then society can in some sense be said to be learning.

Of course, many readers will object that I am using an inappropriate analogy, that only individuals really learn. It is only individuals, it would seem, who have the quality "mind" required for learning; it is only they who think and act. But the social system is composed of minds, individual learners, who necessarily think, learn and act among the products of other minds. Learners live and learn in a world of lesson-sets as necessarily as they breath in our atmosphere. So in some ways it is more complete and accurate to talk of learning as a social process than to talk of it occurring in isolated individuals. By comparison, an apple is not just the product of a tree, a mere stick of wood. The tree plants roots in the soil and spreads its leaves to the sun, and the apple is the product of the whole. Similarly, learning, which at close view looks like the product of individuals, is seen from a broader view as the fruit of the interaction of learners and supra-individual lesson-sets.

A change in the lesson-set can be seen as good or bad according to many criteria. Here, I will suggest one: the extent to which the change increases or decreases the range of the social system's adaptibility in time and space. The first amendment probably has increased our society's ability to adapt over time to changing circumstances. "Love your neighbor as yourself" has greater range in time and space than "Love Protestants and kill Catholics."

Of course, a new lesson need not be a universalizable maxim to add to the society's lesson-set's overall adaptibility. The new lesson may simply fill a local or temporary need. Our current energy crunch, for example, may best be met by developing a mix of many techniques, no one of which is for all places and times, but which together offer us a greater range of responses.

So I would suggest that a prospective addition to a lesson-set be evaluated by asking, "Will this lesson increase the range of our society's adaptibility in time and space?"

The social system as I have described it learns in interaction with its environments. Those interactions occur through individual learners, conditioned by the perceptual screen of their lesson-sets. Four environments can be distinguished. The first is the physical environment. The second is the social environment within the social system itself, the condition of the members and the quality of their relations. The third is the environment of "foreign" social systems with which the social system in question interacts. I include a fourth, a spiritual environment, something like a ground of being and a source of grace. Societies seem to specialize in certain of these environments to the detriment of others. We, for instance, know a lot about the physical but care little for the spiritual. I suspect a society's range in time and space is fostered by a balanced attention to all four.

So far, I have offered a simple model consisting of a social system of lesson-sets and learners interacting with environments. From this we may distinguish a variety of kinds of learning. "Environmental learning" adds knowledge about environments to the lesson-set. "$E=MC^2$" is of this kind. "Lesson-set learning" adds to the lesson-set knowledge about the lesson-set itself. The increasing dissatisfaction from many quarters with the efficacy of prevailing big government solutions to special problems is an example of lesson-set learning.

The beauty of the dialectic of learners and lesson-sets is that it allows social systems to transcend themselves. Through the

agency of individual learners the supra-individual lesson-set is remade, remaking individuals in turn. Such remaking might be termed "meta-learning."

One kind of lesson-set learning deserves special attention: "deutero-learning," or learning to learn. When learners examine how their social system learns and the social system incorporates their lessons into its own operations, the social system can be said to have learned how to learn. Western society, for example, has been quick to recognize what is conducive to scientific learning about the physical environment and has institutionalized support for such learning. We have been slower to learn other kinds of learning.

The Future

Increasing society's ability to learn helps us deal with the two parts of the future--the part that is foreseeable and the part that is not.

First, societal learning increases the range of what we foresee. At the level of greatest accuracy, that brand of societal learning called science greatly increases the scope of what we are able to predict about the material world. With less claim of accuracy, the social sciences allow some prediction in the social world. Among futurists, there are forecasters who increase our vision of what is likely. Other futurists, while not claiming to forecast, do increase our foresight of alternatives. As I have put it elsewhere, "futurists make possible futures more real for others."[1] In most cases, these scientists and futurists increase that part of the future which society can foresee.

Societal learning is also important in helping us deal with that part of the future which is not foreseen. No matter how powerful our foresight, it is not likely that we will be able to see more than a small part of the actual future, especially in an era of turbulence. We must have the capacity to deal with the unforeseen, and that capacity is the capacity to learn. Here, "learning to learn" becomes especially important. If our society has learned general principles about how to learn, these can be applied to meet a wide variety of unforeseen circumstances. One of the best services we can perform as futurists is to learn how societies learn and act to see that what we learn is incorporated in society's operations.

Education

As educators, we must first recognize that producing good learners is a necessary but not sufficient condition for producing societal learning. We must balance our concern with individuals by a concern for society; we must keep our eye on the dialectic of learners and lesson-sets.

Second, we must encourage those skills which will help learners participate in the dialectic. To begin, learners are served by gaining such a thorough understanding of the existing lesson-set that they see sharply its dilemmas and potentialities. Learners are helped by an atmosphere of leisure (school) and openness to exploration, not one demanding cramming for exams. Learners should be rewarded for developing group learning skills, rather than being graded in isolation. To become effective participants in the process of moving individual insights to the level of societal understanding, students should learn skills of communication and persuasion. Finally, students should be given an understanding of the dialectic itself, in order to become more effective participants in it.

Third, we should restructure our educational systems so that they themselves become better learners, for more rapid introduction of socially relevant curricula and for modeling for students what societal learning can be.

Finally, we should encourage, but not control, a wide diversity of non-formal learning channels such as learning exchanges, home information systems, and alternative media.

Newsletter

One such alternative is a Collective Newsletter on Collective Learning which I would like to start with others interested in how social systems learn. Its purpose will be to share lessons about societal learning and to promote deutero-learning for the emerging global society. It will be a pocket-money, low-key mimeologue among participants. If you would like to contribute material or subscribe, please write to me at Woodstock, Connecticut, 06281.

Lessons

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Thomas Kuhn. The Structure of Scientific Revolutions. Chicago: University of Chicago, 1970.

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[1] John McClellan, "What is a Futurist?" Futures Information Interchange, Fall, 1975. John McClellan and Peter Wagschal, "What is a Futurist?" Pass-Age, Spring, 1976.

Museums as an Educational Resource

by Cathy Horvitz

A futures exercise showing how a look at tools from the past can help generate ideas for the future.

The tools we use in our everyday lives are very different from those in use several generations ago, and most likely they are different from those which will be in use in the future. However, most of us take them for granted. Old tools can provide an interesting light on our lives in the future. The materials for study can be found somewhere in almost every town or city.

This particular exercise was based on an educational tour through a farm museum in a small town in Massachusetts, though it could work equally well using the collection of your town's historical society, or even an attic, garage or basement collection of old household and industrial items.

The exercise is meant to increase awareness of the tools we use in our daily lives: how these are made and how they are different in character from those used in the recent past. It especially looks at the social and environmental costs of technology, and suggests a method for using artifacts from the past to design new ones for the future. This is essentially an embellishment of today's technology assessments, which uses the past as an entry point into the future.

The setting for this future exercise seems unlikely. We used the Hadley Farm Museum, housed in an 18th century barn with huge handhewn beams, wooden pegs instead of nails, rough sawed boards and lots of dust all around. The large and varied collection of the museum is all on display in the barn, causing it more to resemble a warehouse than an art museum. Items are not well identified and this all leaves plenty of room for imagination and speculation on the part of visitors.

The articles in the Farm Museum range from home implements such as butter churns, crocks, wooden bowls, irons, apple peelers and drying racks to peddler and station wagons and an old stage coach. The entire outfit of a 17th century cobbler shop, a set of cooper's tools and a working broom-making shop are housed in the barn. Agricultural implements such as grain flails, planters, ploughs and more modern threshing machines and motor operated combines are represented. Spinning and weaving tools, gambrels for slaughtering animals and sausage stuffers to process the meat, soapstones to keep sleigh-riders warm, and an old well complete with pulley, wheel and belt give an idea of the breadth of this collection. Any old and unusual items will do as a starting point.

The Exercise

Age: Junior High

Materials needed: Large pad of newsprint, magic marker; one sheet of paper for each student, entitled at the top "Inventory Sheet of Obsolete Items."

(1) After a brief orientation tour through the museum, go on a 10 minute scavenger hunt looking for as many things as you can find which are obsolete. These should be recorded individually, as you see them, on the inventory sheet provided. It is not important to define "obsolete" too clearly at this point, as it will come up in the discussion

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following, with specific examples. If you have a large group, you may want to split them into teams which will cover one floor of the museum.

(2) Come back together as a group to discuss what was found. Leaving room for a second column next to the first, list on the newsprint pad items from the hunt. With a large group, suggestions for the group list should be limited to two or three per person.

Make a second list next to the first one of corresponding items which have replaced the obsolete items, i.e., their modern counterparts. For example, a butter churn has been replaced by a large industrial machine which mass produces butter for homes.

Look at the two lists of tools/technologies. On a new sheet of newsprint, generate a third list of the general characteristics of the old versus the new. Look especially at social and environmental costs and benefits of each item. This is similar to a technology assessment done before developing new technologies today. The results of this stage might show that old technologies from the 19th and early 20th centuries use local materials in their manufacture; that they were decentralized in use; simple to install, maintain and operate; were durable and recyclable; and encouraged a self-reliant lifestyle. New items save energy and time for the user; use fossil fuels instead of renewable energy sources (e.g., oil instead of wood or muscle power); and hurt the environment through pollution.

When you have a substantial list of characteristics, look at them and decide as a group which you prefer. You might also get into a discussion of the difference between "tools" and "technologies."

(3) Now go back through the museum and take an inventory of all the items which could still be used today, as they are, or with minor revisions which would make them better according to your design criteria. (This may have been done already through the group discussion.)

(4) Coming back together as a group, look at the list of useable technologies you have just made, and the list of characteristics you have identified as liking. With these in mind, generate a future scenario of what life will be like in your area in the year 1999. You can make up new technologies or use any present ones you know of, as long as they fit the design characteristics the group has decided on.

(5) When everyone is done (this can be a homework assignment) share the scenarios with each other. They can be further embellished with drawings or models if you wish.

Other Activities

Looking at the past can also tell us something about our lifestyle in the present. How different would cooking and cleaning be if we only had the things on the "obsolete" list? Most of the things in the Farm Museum were used before electricity was prevalent. You could do an energy conservation-oriented inventory of your own home with this in mind: what appliances in your home run on electricity? Which of them do you really need? Which could you do without?

For younger children, the museum can be the source of a treasure hunt as well. Ask them to find two items (which we do not use today) that helped people to keep warm, to make food, to make clothes, for light and for transportation.

Several interesting examples of images of the past which have found their way into our everyday language can be found in the Farm Museum. "Station wagon" and "horse power," for example, could spark research and discussion on the derivation of words, and how their meanings change over time.

Another avenue for research might be patents. What patents have been applied for that never made it, or that are no longer in use? What things might be useful to invent that nobody has yet patented?

Images of the Future

by James Masker

The "Images of the Future Questionnaire" was originally developed for the National Science Foundation's "Northeast Regional Appropriate Technology Forum." The results of this survey can be found in Tools for a Change, GPO document #NSF RA 790009.

Beginning in the early 1960s, an increasing number of scholars from a variety of academic disciplines began to emphasize the significance of images of the future in both our personal and societal day-to-day and long term decision making. These images are mental representations of our conscious and unconscious values, attitudes, and opinions about the past and present woven simultaneously into a projection of assumptions about the shape of the future. Whether planning a vacation, a career, a business merger, or a national energy policy the decision to pursue a specific course of action will largely be determined by one's image (assumptions) of what the world will be like in the coming years.

In traditional cultures the key to the future is to be found in close adherence to the ways of the past. Numerous anthropological studies exist which detail the role of elders in transmitting ageless rituals, myths, and skills to their youth. With minimal social, technological, or environmental changes occurring from one generation to the next, one is assured of survival in the future by replication of "the ways of our forefathers."

The situation becomes more precarious for societies and cultures in a state of flux. To exemplify this predicament, Alvin Toffler, in Learning for Tomorrow, asks the reader to imagine the ramifications of a dam building project several hundred miles upstream from a traditional, river-based Indian society. For centuries the men taught their sons to build canoes and to fashion nets and hooks to catch fish. An elaborate trading and social network developed around the river as it became the primary source of transportation and communication. Suddenly, the water flow is drastically disturbed. What value is the society's traditional image of the future when the foundations of an entire group of people change? Without evolving more realistic images of the future, changing societies seriously lessen their chances for survival.*

The United States is confronted with this predicament today. An image of the future based on unlimited natural resources, unceasing economic growth, negligence of environmental health--in short, the "growth paradigm"--is no longer a viable option for our nation. It is no longer viable because we are evolving a more contemporary awareness of the delicately balanced interdependence of environmental and human systems. Highly radioactive wastes will remain in the environment for thousands of years. Pesticides and herbicides cause innumerable illnesses to plant and animal life. Highly toxic chemicals dumped into small areas pollute drinking water and release deadly poisons into the air and soil. All of these effect the nutrient and hydraulic cycles which in turn effect the food web of which we are an integral part.

The challenge to educators is immense. Toffler lucidly observes,

> All education springs from some image of the future. If the image of the future held by a society is grossly inaccurate, its education system will betray its youth. A false (inappropriate) image of the future destroys the relevance of the education effort.

We must begin exploring the weaknesses and fallacies of the prevailing image of the future with our students and commence developing more appropriate images of the future. This process will unquestionably challenge many of the accepted attitudes about education and the role of children in our society.

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*Farley Mowat's People of the Deer and Colin Turnbull's The Mountain People are excellent examples of real people undergoing excessive change. Neither is very optimistic about long term survival of rapidly changing societies.

But it must not be forgotten that the future is as much our children's concern as it is ours.

Although images of the future include both technological and social components, the questionnaire included at the end of this article focuses primarily on technological images. This does not imply that technological images are more important than social images. Rather, the initial impetus for the development of the questionnaire (research for the Northeast Regional Appropriate Technology Forum) was technologically oriented. It is important, therefore, that the results of the questionnaire be used and evaluated within this technological context.

As with any tool, the questionnaire should be adapted to your specific needs. I would greatly appreciate receiving information about any changes you make in it and why you found it necessary to make them. Similarly, I would ask anyone who uses it to write a brief summary of the major findings and send it to me, care of this newsletter. An article relating this information will appear in a later issue.

The questionnaire is organized to afford a progressively greater refinement of one's image of the future. Part One generates a list of specific images. Part Two, question 1, asks the respondent to make a generalized value statement about the future. Part Two, question 2, looks for an individual's perceptions of the key trends in today's world that will play a dominant role in shaping her/his image of the future. Part Three provides an opportunity to project a preferred image of the future. Those who liked their images can think of ways to bring them about. Those who don't like what they "saw" have an opportunity to express what they hope their town will be like in the future.

Oftentimes students will have difficulty choosing one of the three options in Part Two, question 1. To help them, say you agree it is tremendously difficult to decide whether one's image of the future is better, worse, or the same as today. The purpose of this question, however, is to give them an opportunity to place a value on their image. Ask them to think of all the images they saw during the time travel exercise. Is their overall general sense that the world got better, worse, or stayed the same? They should only be concerned about their own valuing of the image; not what they think someone else would say.

Determining that trends do exist and that individuals within a group hold similar ideas is the first step towards recognizing the pervasiveness of certain images of the future in societies. Once your students have completed the questionnaire, have a discussion concerning what each perceives the future will look like. Then, take each question and compile lists of everyone's responses. For example, with Part One you could list general categories on the board such as transportation, housing, communications, environment, etc. Each student would give their specific images in each category. This would be to determine how divergent or convergent their images are as a class.

Your class may want to experiment with the questionnaire. They could administer it to other grades, the faculty, their parents, etc., and discover what similarities or differences exist in various groups' images of the future.

The questionnaire could serve as the beginning of a study of the future. Once your students have more clearly defined their images of the future, they could research the likelihood of their images becoming a reality. They could use the futures wheel and cross-impact matrix to determine the various interdependent effects of their various images. They could look to qualitative data, use library resources, contact local, regional, state, and federal officials, and experts. They could explore the environmental implications of their images of the future to determine if serious ecological deterioration would be a likely result. The relationship between technological and social images should also be explored.

There are several important goals for a study of technological futures. Students will be able to broaden their awareness of the multiplicity of possible alternative futures. They will be able to consider the implications of their images of the future on human and environmental systems. Ample opportunities will exist to revise inappropriate or undesirable images. Perhaps most importantly, students should be given the chance to begin creating their image of the future through practical, concrete, hands-on experiences. In this way students will learn that the future is a creation of the decisions and actions of numerous cooperatively functioning individuals.

IMAGES OF THE FUTURE QUESTIONNAIRE

This questionnaire was developed to find out what people think about the future. It must be emphasized that you should focus primarily on technological images. You may want to mention social changes you find in the future. But think about the gadgets, hardware and pieces of technology you think will exist in the future.

In each of the three parts you will be asked to make or to select statements which reflect your ideas about the future. Do not worry about getting "right" or "wrong" answers because no one really knows what the future will look like. You should try to be as creative and imaginative as possible.

* * * * * * * * * * * * * *

PART ONE

Instructions:

Read the statement below and write your description in the space provided on the back of this sheet. You won't have enough time to write complete sentences. So jot down only words or phrases that best represent what you see in the future.

Pretend that your school has just purchased a time machine and chose you to be the one from your school who gets to travel in it. Imagine that you are sitting in front of a control panel with a lever that activates the time machine. When you push it forward, you will be transported 50 years into the future. The year will be 2029 A.D. and you will appear in the middle of your home town or city. Because of the design of this particular time machine you will only have 5 minutes to look around before you are returned to your classroom.

Your friends will be counting on you to tell them what your town or city looks like in the year 2029 A.D. You will be looking to see in what ways your town or city has changed and in what ways it has stayed the same with regards to the technology, machines, architecture, etc.

Push the lever forward. Have a nice journey.

* * * * * * * * * * * * * *

Now that you have returned from the year 2029 A.D., you will make two lists. First, make a list of everything you saw that was different from today. Then, make a list of everything you saw that stayed the same.

Use the back of this sheet of paper for your lists.

* * * * * * * * * * * * * *

PART TWO

All of the questions in this part are based on the time machine journey you just completed.

1. In Part One you were asked to travel into the future. Circle the statement below which best describes what you saw in the year 2029 A.D. Circle only one statement.

   A. In the year 2029 my city or town looked better than it does in 1979 A.D.
   B. In the year 2029 my city or town looked about the same as it does in 1979 A.D.
   C. In the year 2029 my city or town looked worse than it does in 1979 A.D.

Note - If you selected "A" in the question above, go on to question 2. Then go to Part Three.
If you selected "B" in the question above, go on to Part Three.
If you selected "C" in the question above, go on to question 3. Then go to Part Three.

2. Why did your city or town look better in the year 2029 A.D.? Give specific causes or reasons.

3. Why did your city or town look worse in the year 2029 A.D.? Give specific causes or reasons.

* * * * * * * * * * * * * *

PART THREE

1. In Part One you were asked to travel into the future. Circle the statement below which best describes your reaction to what you saw in the year 2029 A.D.

   A. I really hope my town or city looks the way I saw it in the future.
   B. I really hope my town or city does not look the way I saw it in the future.

Note - If you selected "A" in the question above, answer question 2.
If you selected "B" in the question above, answer question 3.

2. Since you hope your town or city looks the way you saw it in the future, what can you do now to help make it happen?

3. Since you hope your town does not look the way you saw it in the future, what do you hope it will look like in the year 2029 A.D. List the major features you hope are different.

Brainstorming as a Divergent Thinking Activity

by Neal Norris

Despite recent criticism of its validity, brainstorming continues to play a useful role in the creative problem-solving process.

Of all the divergent thinking and problem-solving techniques, brainstorming is probably the oldest, simplest, and most widely used. Even before its methodological formalization in the 1950s, informal brainstorming had been used by business, military, economic, and political groups to formulate strategy, generate options, develop contingencies, and expand the number and variety of possible problem solutions.

On the other hand, the name has also retained some of its colloquial color. It has been applied to persons smitten with a short but violent fit of insanity, a sudden bright idea, or an idea considered to be mostly harebrained.

The use of brainstorming in education, particularly in the classrooms of a growing number of futurist educators, has expanded to the point where serious consideration must be given to its validity as a divergent thinking technique. This paper will present a summary analysis and evaluation of recent brainstorming research, thereby providing futurist educators with greater awareness of the limitation and potential of brainstorming as a classroom tool.

Though in use before this century, it was not until the 1950s that brainstorming was generally used as "a systematic creativity training technique."[1] In fact, Erich Jantsch credits brainstorming as being the fundamental ideational and consensus generating intuitive thinking technique from which the others were derived.[2]

Brainstorming was further popularized by the publication of Brainstorming--The Dynamic New Way to Create Successful Ideas by Charles Clark in 1958, and Applied Imagination: The Principles and Procedures of Creative Problem-Solving by Alex Osborn (lauded as the originator of the technique) in 1957.

During this period, four major versions of the brainstorming technique evolved: (1) "straight" brainstorming, (2) the "buzz group" technique, (3) the "operational creativity" approach, and (4) the "stimulating supervision" technique.

Straight brainstorming may be used by individuals or groups and is built around the hypothesis that at least some good ideas will be included in the large number of ideas generated during a brainstorming session.

Several basic rules must be followed if brainstorming is to succeed in generating the number and quality of ideas desired. Combining the rules specified by Eugene K. von Fange[3] and Alex Osborn,[4] the following set of basic rules may be obtained: (1) State the problem in basic terms, with only one focal point; (2) Defer or suspend judgment; evaluation follows the session; (3) Free-wheel. Reach for any kind of idea, even if its relevance may appear remote. Quantity is sought; (4) Tag on; don't wait for an idea--make another one out of the last one given by changing it in some way; and (5) Provide the necessary support and encouragement to allow fellow group members to liberate themselves from inhibiting attitudes and stale mindsets.

In addition to generating a host of ideas, as in straight brainstorming, the buzz group also aims at producing group consensus,

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usually among six people. Another technical refinement is added in the operational creativity approach: the precise nature of the problem under consideration is known only by the group leader, who then structures the discussion in such a fashion that one solution is developed. An even narrower version of brainstorming is the stimulating supervision method, which is used strictly as a training technique. Usually an imaginary situation is created and the most logical problem solutions are then sought.

The enthusiastic and uncritical application of brainstorming as a primary source of fresh ideas and shortcut to creative problem solutions was constructively tempered in the 1960s. Indeed, the large advertising firm of Batten, Barton, Durstine, and Osborn (BBDO) in Buffalo, New York (one of the principle promoters of brainstorming during the 1950s) replaced it with the "Demon" model based upon techniques borrowed from operations research and decision theory.

NATO, Lockheed, and several other industrial and military organizations continued to reserve a particular role for brainstorming during the 1960s, but the technique has slowly been removed from center stage and taken its place instead as one element in a larger procedural framework that incorporates pre- and post-brainstorming analytical steps. In education, however, the brainstorming technique has retained its usefulness--both singularly and in conjunction with other problem-solving methods. Indeed, brainstorming has been widely used by futures teachers at all levels because of its apparently simple rule structure and strong motivational power.

With this historical information in mind, some discussion of research findings seems appropriate. To date, the general conclusion which has been reached is that the research has been somewhat sporadic and inconclusive.

On the positive side, research has offered some encouraging conclusions. For example: (1) brainstorming experience can increase the score of participants (Meadow and Parnes, 1959); and (2) more "good" ideas are generated if all ideas, however remote, are allowed, than if only "good" ideas are admitted (Meadow, Parnes, and Reese, 1959).

Much of the negative reaction to the claims of brainstorming advocates has, for some reason, been reflected in the research of the past several years. Two 1977 research studies, both conducted by William K. Graham, have stated in the introductory remarks that: (1) individuals working by themselves produce more ideas than those working in groups; and (2) efforts to improve performance during brainstorming sessions through training, practice, or other modified procedures has had little success.[5]

From these statements Dr. Graham reaches the conclusion that "brainstorming according to the rules proposed by Osborn is an inefficient way to generate ideas."[6] It is important to examine these two studies specifically, since the charges made contain potentially serious implications for at least one version of brainstorming as an effective divergent thinking technique.

The first Graham study sought to test the comparative effects of simulated biofeedback and human monitoring on brainstorming performance. The subjects were 120 male and female undergraduate psychology "volunteers" who were randomly assigned to one control and five treatment conditions: EEG monitoring with feedback, EEG monitoring without feedback, GSR monitoring with feedback, GSR monitoring without feedback, and human monitoring with feedback. The control condition consisted of receiving Osborn's brainstorming instructions.

The "Thumbs" problem was assigned in all six conditions,[7] twenty minutes were allowed for brainstorming problem solutions, and scoring followed the rules established by Bouchard.[8] It was found that "physiological monitoring and simulated biofeedback inhibit performance on divergent thinking tasks, whereas human feedback of the sort used in this study may lead to higher levels of performance."[9]

The second Graham study concentrated upon the level of idea acceptance caused by individual and group brainstorming. Again 128 undergraduate psychology majors were the subjects. Sixty-four (64) students were assigned to nominal four-person groups after brainstorming as individuals, while the remaining sixty-four (64) were placed in real four-person groups. The "Thumbs" and "Education" problems were used in this study, and twenty minutes were allowed for the brainstorming session.

After the alloted time had elapsed, all groups were asked to: (1) choose the single best idea developed in the group; and (2) rate the chosen idea on a semantic differential scale ranging from +3 to -3. The time taken to select the best idea and the mean evaluation of the best idea were also noted.

Study results indicated that: (1) nominal groups (students brainstorming alone) produced more ideas than real groups; (2) the "Thumbs" problem promoted more ideas than the "Education" problem, reinforcing the notion that realistic and important problems tend to stimulate fewer ideas than nonsensical or trivial problems; (3) best ideas were selected more rapidly for the Thumbs (nonsensical) problem than for the Education (important) problem; and (4) no discernible mean judgmental differences regarding the choice of best idea was noted.

Some critical comment upon these two studies and their results must be offered to separate the various issues involved. These comments are offered from personal experience with the brainstorming technique, both as participant in, and group leader of, various age-level groups.

First of all, these recent studies seem to have relied exclusively upon written rather than spoken brainstorming. Often, however,

brainstorming (especially in educational settings) is spoken with one or more monitors jotting down ideas as they are given by various group members. Although there can be an active and pronounced "groupthink" phenomenon working in these groups who use the oral brainstorming method, many times the encouragement of rapid idea generation on the part of the teacher and the appointment of four or five student monitors will alleviate at least part of this problem. (This depends, however, upon the age of the group, the strength of perceived peer pressure, and the nature of the problem under consideration.)

The reliance, in one study, upon small four-person groups, and in the other, upon larger twenty-person groups, can cause some important comparative problems. This is especially important, since group size seems to be a significant factor in relation to the number of ideas generated and the time taken to choose and evaluate best ideas.

Another concern revolves around the use of the "Thumbs" problem--a problem which may be open to question as a useful representative sample of nonsensical and trivial problem context. Further study using other problem sets must be conducted before data created using only the Thumbs problem can be accepted.

Then, too, excessive reliance upon preselected subject groups (i.e., freshman psychology majors, nursing students) in both cases may have led to overly homogeneous group composition, which could explain the number and quality of ideas generated. Sexual, racial, age, and problem differences may alter the real versus perceived group heterogeneity. More experimentation regarding these differences also seems necessary before any valid generalization can be made.

The length of group existence and entrance commonalities definitely impact upon the amount of trust, openness, and communicativity of the brainstorming group. These are especially important considerations if the goal is to promote group acceptance of the chosen best idea--a goal begrudgingly offered by Graham as the one possible redemptive quality to an otherwise inefficient method.

Several other questions must also be satisfactorily answered. All the brainstorming research studies cited in both Graham studies came from the early and mid-1970s, except one citation from 1958 which examined the comparative effectiveness of individual versus group use of brainstorming, and two citations from the 1960s regarding industrial samples only.

Yet the conclusion reached by Graham on the basis of these few stated studies is rather sweeping, especially when the positive conclusions of the Meadow and Parnes work (cited earlier) are considered. In fact, the first Graham study states the "Osborn method brainstorming is inefficient" conclusion, while the second study assumes this to be fact and moves on to test the group acceptance of an idea as the "last rationale for the continued use of group brainstorming."[10]

It is ironic to note that Graham is declaring dead a type of divergent thinking methodology which was abandoned as an isolated tool in the late 1950s and early 1960s and has in many areas of forecasting, problem-solving, and decision-making, been used as one element of a larger problem-resolution systems approach. No mention of the various versions of brainstorming was made in either Graham study; rather his indictment seems to imply the methodology in all its forms.

Obviously, this is an overgeneralization based upon extremely limited research evidence, and must be severely questioned. In fact, brainstorming can be a useful divergent thinking technique, particularly when used as one part of an expanded process, which includes such techniques as morphological analysis, zap analysis, synectics, cross-impact analysis, and scenario construction.

Much more brainstorming research is needed to thoroughly replicate previous studies, explore new areas, and test alternative hypotheses--especially regarding the use of oral brainstorming as one element in a more sophisticated problem-solving process.

The futures educator should definitely consider these findings when planning his or her instructional strategy. However, the brainstorming procedure should by no means be removed from the repertoire of useful alternative generation methods. Until further solid evidence can be offered by researchers experimenting in various (particularly educational) settings, brainstorming should remain one of many useful divergent thinking techniques used by futures educators in the classroom.

FOOTNOTES

[1]Erich Jantsch, Technological Forecasting in Perspective (Paris: Organization for Economic Cooperation and Development, Publication Center, 1969), p. 136.

[2]Ibid.

[3]Eugene K. von Fange, Professional Creativity.

[4]Alex F. Osborn, Applied Imagination: The Principles and Procedures of Creative Problem-Solving (New York: Charles Scribner's Sons, 1957).

[5]See William K. Graham, "Effects of Simulated Biofeedback and Human Monitoring on Brainstorming Performance," The Journal of Social Psychology (Provincetown, Massachusetts: The Journal Press), 101, First Half (February 1977), p. 139, and William K. Graham, "Acceptance of Ideas Generated Through Individual and Group Brainstorming," The Journal of Social Psychology (Provincetown,

Massachusetts: The Journal Press), 101, Second Half (April 1977), p. 231.

[6]Ibid., p. 231.

[7]The "Thumbs" problem states that: "We do not think this is likely to happen, but imagine for a moment what would happen if everyone after 1975 had an extra thumb on each hand. This extra thumb will be built just as the present one is, but located on the other side of the hand. It faces inward, so that it can press against the fingers, just as the regular thumb does now. Here is the question: What practical benefits or difficulties will arise when people start having this extra thumb?"

[8]See T.J. Bouchard, "Training, Motivation, and Personality as Determinants of Effectiveness of Brainstorming Groups and Individuals," Journal of Applied Psychology, 56 (1972), pp. 324-331.

[9]Graham, "Effects of . . .," p. 143.

[10]Graham, "Acceptance of . . .," p. 232.

Factors Influencing Art in Capitalistic Society

by Kathleen Chatwood

Art not only acts as a mirror to society; it also leads the way into the future. This artist/educator argues that in a capitalistic society, however, the revealing, predictive function of art is inevitably co-opted and nullified by its entry into market exchange values.

There is an astounding lack of knowledge among educators concerning the field of art. Unfortunately education's lack of a holistic training for teachers affects students, who are also deprived of aesthetic and artistic training. The pervasiveness of this situation is nowhere more apparent than in the one-sided content of school curricula; the pragmatic and logical subject matter is formulated, codified, researched, documented, taught and re-taught thoroughly. Yet students are left on their own when it comes to finding the same encouragement, qualified teachers, time, facilities, or space to do creative learning. Boards of Education and parents are also responsible for perpetuating non-aesthetic learning in schools: "We managed to get by without artistic training; it's less important than other useful types of subjects." . . . so goes an approximation of the line of thought which cuts funding for the arts whenever budgetary constrictions appear.

An increasingly larger number of educational critics charge that this omission of creative learning from the schools' academic priorities is intentional. They see schools functioning as acculturative agencies which prepare individuals to unquestioningly enter the established set of social relations. Through such a process the status quo is preserved and pervasive change is blocked.

I consider the following information relevant to educators who have never questioned the subsidiary position of the arts in society's curricula, to those few educators who have, and to anyone who cares about the future of a civilization as revealed and enlarged by the free operation of its art. This article is not concerned with formal educational institutions and their educative processes. Rather, it documents a type of societal learning experienced by almost every individual in this culture. Such learning in schools de-emphasizes the given artistically creative capacities of the individual in favor of behaviors, bodies of knowledge, and attitudes which reinforce the predominating mode of production and existant productive relations, i.e., class relations, hierarchical, sexist, and racist though they may be. Through the basic analysis which follows, some clearer understanding may emerge for the reader as to both the rationale for and the cultural process used to suppress the free development of art in industrial societies. This article therefore intends to examine the distorting side-effects of industrialism upon the artist, audience, and the cultural field.

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The function of negation which art performs is impeded in industrial society through barriers of legitimization, selection, and marketing systems which co-opt the art product and the artist, neutralizing their critical capacity. Art remains a force of negation presently subject to repressive industrial side-effects. It is not allowed to perform its revealing function freely. The origins of the disaffiliation and isolation of artists, who find their artistic intent and livelihoods in all manner and modes circumscribed and restricted by the capitalistic system which views art as a commodity to be purchased, becomes clearer through the analysis of productive forces and relations.

In order to better understand the suppression of art's negating function under the conditions of capitalistic production, it is helpful to examine such society's particular mode of production as affecting artistic production.

Art performs several major functions in society. One of the most commonly known is the particular function of communication which art promotes. Art helps the individual to more fully understand the broad cultural process of which s/he is a part, while also facilitating relationships with self, others, and nature through the shared reality of art.

There are, however, other functions art traditionally performs when it is allowed to freely be in culture. Art in society performs a "cementing" function in that it holds up pictures of others' realities, showing us that our own emotions have some validity.[1] Art as culture also performs a selective function by choosing only certain aspects of reality to communicate.[2] Art thus acts as a revealer of trends, situations, attitudes, and ideas in culture, influencing the image-making and formation of the self-concepts of individuals who live in the culture. Art is directly involved in the process of cultural evolution by the type of reality a certain artist chooses to portray to others in the culture.

Art can also function as a built-in warning system when the totality of a culture is victimizing individuals within the culture.[3] Because art is a device of cultural transmission and communication, it also can act as a critique and thereby threaten the established social order through its innate capacity to express freedom. Art's free rein or non-repression could be radical and destructive of the existing order.[4]

The Mode of Production

The economic mode of production is a term used to signify the resources a society possesses and the manner in which that society deploys its people to provide for their basic needs (i.e., food, shelter, and other life necessities). There are two facets to the mode of production: (a) the forces of production--the tools, equipment, and materials available for production, also with the level of science, technology, and organization used to employ them, and (b) the relations of production--the relationships between the producers and controllers of social surplus wherein the two general groups represent different classes. The specific type of relationship between producers and controllers depends on the type of society--slave, feudal, capitalistic, or socialistic. The types of class relationship and the level of the forces of production are what distinguish one mode of production from another.[5]

A major dialectical materialistic theory of the cause of culture is that of the base-superstructure distinction. Dialectical materialism views the economic mode of production of a society (i.e., in current western culture advanced industrial production changing to cybernetic modes) as determining the general character of the social institutions of the society. The social institutions, i.e., the modes of family, religion, law, education, and art, are termed superstructures. The political and ideological assumptions inherent in the superstructures operate as given guides for an individual's personal action in that culture which are, in turn, directly due to the economic relations of the base.[6] Generally the transformations of superstructures occur more slowly than in the base and manifest changes in the mode of production.[7]

It is of significance that the relationship between the superstructure and the base is essentially dialectical. Change in the means of production causes transformation in superstructures. Art, however, is different from other superstructures in industrial society because there exists a fundamental contradiction between artistic production and material production in capitalistic society.[8] Marx noted that material production in capitalistic countries ". . . is hostile to certain branches of spiritual production, for example, art and poetry. . . ."[9]

Capitalism is favorable to some forms of intellectual production, specifically that of science, which nurtures production through creation of the technological advances which production requires. Production, in turn, is a natural pre-requisite encouraging a thriving science. Who else but large corporations or the Pentagon can afford to fund modern science? Art does enjoy more autonomy than science, however, because it is connected with other humane, social branches of ideological superstructure.

In ancient societies production had a nature akin to art--products were individual, unique. Such a situation is not found in the current mass-assembly verging on cybernetic mode of production which is based on standardizing products. Art flourishes in capitalism only to the extent that it can elude the grip of such production.[10] The negativity and disgust so obvious in much modern art manifests artists' reactions to the homogenizing tendencies imposed upon art and human beings by capitalistic production. Depiction of the bleak results of such mass production is an ironic means by which modern artists safeguard

their creative freedom.[11] Escapism, criticism, and protest become the content in modern art through which artists assert their nonconformity in a dehumanized world.[12] Unfortunately, capitalistic economics transforms the protest/content of some art into the fashionable, thereby co-opting and neutralizing such artwork's negating function.

There seems to be an obvious antagonism in capitalistic society towards art--first, as a hostility toward the creative and qualitative nature of the labor of art, and secondly, in the very nature of the capitalistic mode of production itself, i.e., strictures imposed by the mass and cybernetic forces of production and the confinement art's negating function finds in market system relations of production.

Alienated Labor

Capitalistic society is innately hostile to individual creation, as evidenced in the way that control of production is taken away from the worker, leaving in his/her stead a mechanized, routine activity which precipitates a formal, indifferent, or hostile attitude in people toward their own work.[13] All too often one merely works from necessity, in order to earn a living. The theory of wage labor sees human beings under such conditions as reduced to the status of a thing--reified, turned abstract, instead of more humane, by their work. The labor process, which should be the means to extend and develop human creative power, is reduced to the means of producing surplus value, that is, profit.

If wage labor is defined by its loss of artistic character, that is, its spiritual and free character, any attempt to extent to the sphere of art the form of wage labor divests art of its own nature! In short, the economic form assumed by labor in capitalistic societies cannot be applied to artistic creation without destroying it.

Market Relations Affecting Art

Most artists are quite conscious of the incompatibility existing between creative freedom and creation for the market. Artistic production in capitalistic countries occurs in a social setting where art is valued for its exchange value or for the status conferred by owning the work of a famous artist who has been legitimized through appropriate market/art channels.

In production for the market, an artist is often forced to limit his/her content or range of expression to conform to the prevalent stylized vogue and to the aesthetics of the wealthier classes, or to create saleable mass art products for artistically uneducated consumers. In a capitalistic society, "Art is a luxury when it is not an investment."[15] The relations of the market system itself drastically affect art and artists, transforming the functions of both in capitalistic society.

The capitalistic market system depersonalizes art by regulating and calculating what is to be put on the market and before buyers in the first place.[16] In earlier times, art had been the results of interests, values, tastes and knowledge of artisans immersed in their community contexts. With industrial and urban development, the freedom of the individual artists indeed increased, allowing greater personal expression, but with the corresponding loss of security provided by a supportive environment.[17] These factors combined to produce a division which still separates consumers, public, and clientele on the one hand, from the producers (artists) on the other.

Cultural Factors Negatively Affecting Art

Art is subjected to a process of legitimization, selection, distribution, and reception resulting in several marked effects on the free interaction of art in a culture.[18] First of all, art pieces must pass through an institutionalized process of approval by critics, dealers, speculators, academics, museums, and administrative bodies for the fine arts--a power structure which holds the tools necessary for artistic careers and which ensures access to any type of promotion in the field.

Secondly, the institutions and market system determine the hierarchy of aesthetic values which are selected to be represented before the public.

Thirdly, the dominating system of the market inhibits small scale individual production and distribution of the independent artisan, setting up all artists as competitors in the field of art production. Artists must mass produce saleable market items in order to win promotion and make a living, thereby being unable to work on singular pieces which are time-consuming in their excellent crafting. The market system represses the artists' right to earn a living income from their work.[19]

Fourthly, the market system ensures the economic success of an artist by controlling the variation of price asked for a work.

Finally, the working people who historically created art from their labor (i.e., utilitarian pots eventually became "useless" objects of admiration, etc.) are alienated from buying and creating art. The capitalistic system provides for a monopoly of creativity by a minority of certified "experts" known as artists.[20]

These factors together bring about an alienation of people from art. Most people have neither the time nor money to relate to art and the aesthetic experience. The inherent creative potential of the individual and of the species as a whole is restricted when art is exploited to achieve the needs of profit. The aforementioned examples illustrate that through the market relations of production not only the artist becomes alien-

ated from her/his art, but also the rest of society is deprived of the benefits or even the awareness of their own latent artistic creativity. An individual's awareness of her/his need for beauty, for meaning in life, for communication with others through the sensuous realm of art (values that Marcuse designates as secondary values just as important as satisfaction of basic needs in our era of abundance) is thwarted in three major ways by the priority production assumes in bourgeois society.

1. Aesthetic repression occurs when aesthetic awarenesses and needs are systematically de-emphasized during socialization in favor of a more pressing need--"earning a living" by developing skills saleable in the market place. The fact nonetheless remains that it is possible for people's basic needs to be provided for in high technological cultures. It is the inordinate accumulation of wealth by a few which prevents an adequate standard of living and enjoyable work for all. The need to "earn a living" by engaging in repressive work seems a necessity by virtue of the prevailing value structure perpetuated by the dominant class to support their profit-making (i.e., the work ethic), by the existing classist relations organizing the productive mode (i.e., male-dominated hierarchies) and by the fact that cooperative, non-alienating alternatives to mechanized, routine work are not allowed to function successfully. Creative labor is thwarted in other superstructural areas as it is in the field of art.

2. Art becomes a field of specialization, as do other areas of life in capitalistic societies. When art falls under the market domain, only a few experts, those who have undergone arduous training or who possess exceptional talent, become capable of providing for their needs through creative labor. Art becomes subject to the laws of division of labor which, as Marx repeatedly emphasized, fragment and narrow the individual's potential for whole being.

3. The overwhelming stress on money and capital accumulation leads to a corresponding de-emphasis on quality for the merely quantitative. Knowledge of art and aesthetic experience come to be regarded as pasttimes of the elite, and are cultivated as vehicles for social climbing. True aesthetic pleasure is forgotten, preempted by a leisure filled with consumption and the public display of wealth. The innate being emphasized in the appreciation of artistic creation is, through market relations, turned into the quality of "having" or ownership of property. The general lack of aesthetic awareness among the majorities of bourgeois culture is a direct offshoot of such societies' economic mode of production. The fact that life for members of these societies is "having" instead of being is due to the substitution of consumption for all other kinds of awareness. The particular nature of mass-production elicits not only the standardized product, but the standardized individual with standardized taste as well. This tendency influences the type of art produced and consumed and affects the very capacity of people in capitalistic societies to understand and appreciate the content of much modern artwork, much of which expresses values which negate the capitalistic value structure supporting commodity consumption.

Conclusion

There exists in capitalistic societies millions of people with whom the real artist is therefore incapable of establishing a dialogue. "The bridges between people and art are broken. Blame rests not with artist or the public, but with the socio-economic relations in capitalism harming both."[21] It is therefore necessary not for the artist to create a public only to enjoy new forms of beauty, taste, or new types of artistic production, but to create a public capable of appreciating art at all.

The lack of aesthetic relations between artist and public is characteristic of the fundamental economic relations of our era.[22] An economic mode emphasizing division of labor also implies the necessary division of the individual from all the capacities s/he may possess.

The economic mode of capitalism--the particular forces and relations of production--curtails the ability for the dialectic of art to operate; the negating function of art seems inevitably co-opted by its entry into market exchange values. Capitalistic society absorbs any content in art which is antagonistic to its social order. Social cohesion is maintained by allowing images originally intended as hostile or critical of that society to become accepted or even useful to it.[23] The natural movement of the dialectic in art is further impaired by people's massive unconsciousness that there is indeed anything amiss.

Informed educators cannot ignore their own unconsciousness of the on-going aesthetic repression which occurs in schools. The fact remains that art is still the least financed of our society's academic subject areas, evidencing the lack of attention our society gives the development of aesthetic awarenesses and skills. Radical artists and educators throughout the country need to initiate programs, ironically federally funded if they must be, to get art back into people's lives, so that it again becomes a recognized need in daily life. Aware artists and educators who can convey to their students the total societal setting affecting art, are needed now more than ever.

FOOTNOTES

[1]Ken Baynes, Art in Society (New York: The Overlook Press, 1975), p. 45.

[2]Ibid., p. 86.

[3]Ibid., p. 87.

[4]Lee Baxandall, ed. Marx and Engels on Literature and Art (St. Louis: Toledo Press, 1973), p. 18.

[5]Michael Albert and Robin Hahnel. Unorthodox Marxism (Boston: South End Press, 1978), p. 18.

[6]Anne Ferguson, "Marxist Approaches to Art and Philosophy Concerning Art," Unpublished, p. 2.

[7]Walter Benjamin, "The Work of Art in the Age of Mechanical Reproduction," Marxism and Art, ed. Maynard Solomon (New York: Knopf, 1973), p. 550.

[8]Karl Marx, Theories of Surplus Value (Moscow: Progress Publishers, 1967), Part 1, p. 285.

[9]Adolfo Sanchez Vasquez. Art in Society (New York: Monthly Review Press, 1973), p. 158.

[10]Vasquez, op. cit., p. 162.

[11]Ibid., p. 164.

[12]Ibid., p. 167.

[13]Ibid., p. 202.

[14]Ibid.

[15]Henri Arvon. Marxist Aesthetics (Ithaca: Cornell University Press, 1973), p. 127 and p. xxiv.

[16]Baxandall, Radical Perspectives, p. 8.

[17]Baxandall, Marx and Engels, p. 22.

[18]Pierre Gaudilbert, "The Cultural World and Art Education," in Art and Confrontation (Greenwich, Conn.: New York Graphics Society, 1968), p. 138.

[19]Ibid., p. 139.

[20]Solomon, op. cit., p. 46.

[21]Vasquez, op. cit., p. 257.

[22]Ibid., p. 263.

[23]Herbert Marcuse, One Dimensional Man (Boston: Beacon, 1964), p. 61.

BOOK REVIEW

Harold Shane's

Curriculum Change Toward the 21st Century

by Dennis Livingston

This short book is the result of the work of the NEA Bicentennial Committee. In clear and concise terms, Harold Shane has organized and elaborated upon the observations of 46 individuals interviewed on the developments most likely to shape the next 25 years, skills education should promote in this context, and premises to guide educational planning. This process of working back from images of the future to relevant goals and implementing strategies is a welcome relief from mindless trend extrapolation, and the book as a whole contains many insights that would be useful to the general public as well as educators. Revising the seven cardinal principles of education issued by NEA in 1918 and adding 28 premises to guide curriculum planning for the next century, Shane develops the concept of "a lifelong human needs curriculum to serve persons of all ages." The guiding imagery is of a complex, interdependent, multicultural planet beset with both great perils and opportunities. Shane stresses a personalized education which flows into and out of formal learning environments, without being tied to arbitrary and outmoded patterns of lockstep education. Detailed curriculum content is not provided, as inappropriate to an emphasis on local planning by teachers and parents, but ample guidelines are given on the skills and attitudes that curriculum should enhance in the coming decades. In sum, this humane and optimistic book should provide support for those seeking a person-centered, global-oriented, and environmentally-sensitive education. A detailed bibliography and excerpts from interview tapes are included.

ABOUT THE REVIEWER

Dennis Livingston is a well-known commentator on the future. He is currently a faculty member in the History Department at Marlboro College, Marlboro, Vermont.